



**Tillamook Urban Renewal Agency
210 Laurel Avenue
Tillamook, Oregon 97141**

Phone: 503-842-2472

Fax: 503-842-3445

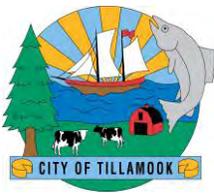
**Public Meeting Notice
September 14, 2011 - 5:30 PM
Tillamook City Hall – 210 Laurel Avenue – Tillamook Oregon 97141
Meeting Agenda**

1. **Call to Order and Roll Call**
2. **Approval of Minutes:** Regular Meeting Minutes of August 24, 2011
3. **Approval of Bills:** \$8,909.75
4. **Public Non-Agenda Items:** Public Concerns/Comments (5 minute limitation).
5. **Pending Business:**
 - a) 3rd Street Phase I & City Water Lines – Liane Welch, Tillamook Co. Public Works Director and Don Hurd, Chairman
 - b) Plan Amendment & Contract – Don Hurd, Chairman
 - c) 1st Street Parking Lot Contract – Paul Wyntergreen, City Manager
 - d) Beals Building Project – Don Hurd, Chairman
6. **New Business:**
 - a) 3rd Street Engineers Invoice September 7, 2011 - \$18,861.35 **APPROVAL**
 - b) Board Discussion of 3rd Street Project Phase II, ODOT Intersection & Finances
7. **Committee Reports:**
 - a) Streetscapes Committee – Lynda Casey
8. **Correspondence/Information:**
 - a) Extension of 3rd Street Line of Credit #148
 - b) Letter from David Mast regarding Tillamook PUD Transmission Line Relocation
9. **Concerns of the Board/ Non-Agenda Items**
10. **TURA Meetings:**
 - a) Regular Board Meeting – September 28, 2011 @ 5:30 pm
11. **Adjournment**

This is a public meeting per ORS Chapter 192. The Board reserves the right to adjourn into Executive Session per ORS 192.660. The meeting location is accessible to persons with disabilities. Please contact the office of the City Manager of Tillamook at 503-842-2472 should special accommodations be required for citizens with visual or hearing impairment. Persons with hearing impairments may contact the Oregon Relay Service at 1-800-648-3458 (TDD) OR 1-800-648-4442 (VOICE)

**Posted September 12, 2011
Tillamook Fire District * Tillamook City Hall * Tillamook County Library *Tillamook County Court House**

Agency Board Members:
Chair: Don Hurd; Vice-Chair: Carolyn Decker
Joe Martin, John Sandusky, Alene Allen, Lynda Casey, Dave Schrom
Administrator: Paul Wyntergreen, Executive Assistant: Debbi Reeves



Tillamook Urban Renewal Agency
210 Laurel Avenue
Tillamook, Oregon 97141

Phone: 503-842-2472

Fax: 503-842-3445

TURA Regular Meeting
Wednesday – August 24, 2011 - 5:30 P.M.

Board Members Present:

Chairman Don Hurd
Vice Chair Carolyn Decker
Alene Allen
Lynda Casey
Joe Martin
Dave Schrom
John Sandusky

Staff Present:

Paul Wyntergreen: Administrator
Debbi Reeves: Executive Assistant

Guests/Public:

Milt Johnson, Kathie Gordon-Brooks

- 1) **Call to Order and Roll Call:** Chairman Hurd called the meeting to order at 5:30 p.m. and asked Reeves to do the roll call. All Board members were present.

- 2) **Approval of the Minutes:** The first item on the agenda was for approval of the minutes of the August 10, 2011 meeting. Chairman Hurd asked if there were any corrections or additions. Decker asked about paragraph one on page 2 regarding Concerns of the Board. There was a word missing in one of the sentences, which will be amended.
 - Decker made a motion to approve the minutes of August 10, 2011 with the correction as noted. Casey seconded the motion. The motion passed unanimously by all board members seated.

- 3) **Approval of the Bills:** Chairman Hurd asked Reeves to comment on the bills. She noted the CPA billing was the final billing for Baertlein & Phegley CPA as the new firm Bryan P. Fitzsimmons CPA took over the accounting on July 1, 2011. The invoice from the attorney was for the Saito contract on the Beals Building.
 - Martin made a motion to pay the bills in the amount of \$865.00 (checks #567 - #568). Sandusky seconded the motion. There was discussion about the Saito contract. Hurd called for the vote and Ayes were received by all board members present and the motion passed unanimously.

- 4) **Financial Report:** **Chairman Hurd** asked **Milt Johnson** and **Kathie Gordon-Brooks** to go over the July 2011 financial Statement included in the board packets. **Johnson** explained the lay out and what had been included in the statement. He went over the budget and accounting system. The board asked questions for clarification of different items on the statement, which were explained by **Johnson** and **Gordon-Brooks**. **Wyntergreen** commented on the budget. **Johnson** noted a Year-to-Date (YDT) column will be added to the next financial statement as requested by **Reeves**. **Wyntergreen** asked the board if the financial statement looks good to them and consensus was yes.

➤ **Sandusky made a motion to accept the July 2011 Financial Statement as presented. Decker seconded the motion. Hurd called for the vote and Ayes were received by all board members present and the motion passed unanimously.**

- 5) **Public Non-Agenda Items:** None

- 6) **Pending Business:**

- a. **Plan Amendment:** There was board discussion regarding the two proposals for the Plan Amendment and services. **Chairman Hurd** would like the board to consider hiring **Elaine Howard Consulting**. The costs of the proposals were discussed. There was discussion about TURA Attorney **Jeannette Launer** stating it would require a substantial amendment for what the TURA was looking at amending in the plan and one of the **Leland consultants** saying it may not require a substantial amendment to the plan. **Howard** had agreed with **Launer** that a substantial amendment would be required.

➤ **Sandusky made a motion to accept the Plan Amendment proposal from Elaine Howard Consulting. Decker seconded the motion. Chairman Hurd called for the vote. Ayes were received by all board members present and the motion passed unanimously.**

- b. **1st Street Parking Lot & City Council Response:** **Wyntergreen** explained to the board the proposal that was sent to the City Council and what the City Council changed and added to the proposal. (*NOTE: There was a handout of the original proposal to the council for comparison to the changes*). There was discussion about the changes, which include a triple net lease agreement, as recommended by CityCounty Insurance Service (CIS), a mutual 120 day notice of termination, and quarterly payments of gross rent receipts from the City to TURA. The other items listed in the TURA proposal were agreed upon by the council.

Wyntergreen explained another brochure handout regarding the Energy Transfer Merchant (ETM). The EMT is a station for refueling electric cars and he explained there could be one installed in Tillamook in one of the downtown

Agency Board Members:

Don Hurd: Chairman; Vice Chair; Carolyn Decker
 Joe Martin, John Sandusky, Alene Allen, Lynda Casey, Dave Schrom
 Administrator: Paul Wyntergreen, Executive Assistant: Debbi Reeves

parking lots. There was discussion about this issue. **Wyntergreen** noted this station could affect the lease agreement on the parking lot. **Chairman Hurd** would like to hear a motion to proceed with the lease agreement with the City of Tillamook with a slight modification for the EMT.

- **Schrom made a motion to accept the City Council revised proposal for the lease agreement on the 1st Street Parking Lot and to proceed with the contract. The motion was seconded by Decker. Hurd called for the votes and ayes were received by all board members seated. The motion passed unanimously.**
- c. **Beals Building Project: Chairman Hurd** commented he had telephoned **Saito** several times with no response. There was discussion about getting a signed contract and the process for painting and adding the awning to the building. There was discussion about the current tenant closing her business and future tenants. Nothing can proceed until there is communication with **Saito**.

There was further discussion about the area near the Beals Building. **Hurd** noted the Elks Club had voiced an interest in TURA funding several months ago. **Reeves** mentioned a person from the Elks Club had picked up the color pallets within the past few days. The Elks Club building was discussed as well as the other buildings across the street from the Elks Club. **Hurd** and **Wyntergreen** had been over to look at the parking lot behind the Dutch Mill Restaurant and the parking lot across the street. Both lots need to be cleaned and resurfaced. **Hurd** said the whole area needs to be considered. *(There were several conversations going on between board members at this time.)* There was discussion about the city owned alley between the Beals Building and the Elks Club. **Hurd** mentioned the parking lot behind the Elks Club and the Safeway parking lot. **Chairman Hurd** will contact **Bob Wester** of the Elks Club.

7) **New Business:**

- a. **3rd Street Engineering July 2011 Invoice #2:** **Chairman Hurd** said the next item on the agenda was the second billing for the month of July on the 3rd Street ROW's. **Hurd** asked for a motion to approve payment of the invoice.
 - **Sandusky made a motion to pay invoice #0816111482 in the amount of \$18,794.65 to Tillamook County Public Works. The motion was seconded by Martin. Chairman Hurd called for the vote. Ayes were received by all board members present. The motion passed unanimously.**

Chairman Hurd commented **Rich Gitschlag** had contacted **Reeves** and told her there was an issue with the plants that were to go into the retaining wall at the 1st Street Parking Lot. The plants has been left in the care of **Dave Hollandsworth** and died before being

planted. Landscaping of the parking lot was discussed. **Hurd** has spoken with a landscaper about adding more plants to the area. There was discussion about care of the plants at the parking lot at this time and adding more landscaping. **Allen** wondered about hiring a contractor for watering. **Wyntergreen** will check with Public Works and see what they might be able to do. **Hurd** also mentioned lack of outside water at the Public Market building. In going back to the issue of the **Hollandsworth** plants, **Reeves** said **Gitschlig** had recommended TURA not replace the plants as they had already bought plants once. Consensus of the board was to wait and see if there is a request to replace the plants.

8) **Committee Reports:**

- a. **Streetscapes:** **Casey** gave a report on the most recent Streetscapes committee meeting. **Wyntergreen** will be making a board proposal for Phase I of the 2nd Street project. She explained that **Reeves** had presented a couple of ideas to the committee about an Art and Wine Walk for downtown Tillamook and a downtown cleanup volunteer crew. These ideas will be taken to the TRA and the Beautification Committee. **Casey** also spoke about the vacant window art painting project being considered. There was discussion about the Blue Moon building siding and a possible field trip to look at the inside of the building. **Chairman Hurd** mentioned the email he had sent to the board regarding committee roles and recommendations. There was discussion about the building, what needs to be done and how it looks.
- b. **Grant Loan Application Committee:** **Sandusky** and **Wyntergreen** presented the revised draft of the Grant–Loan application, guidelines and agreement to the board. The board went over the forms and made amendments to the drafts. There was discussion about credit, Town Center priority, deadlines, bank involvement in the process, and TURA involvement in monitoring a project. **Wyntergreen** went over the items amended by the board.

➤ **Sandusky made a motion to accept the TURA application, guidelines and agreement with the amendments as noted in the record. The motion was seconded by Allen. Chairman Hurd called for the vote. Ayes were received by all board members present. The motion passed unanimously.**

9) **Correspondence:** **Chairman Hurd** mentioned the insurance on the Janac Building had been rewritten.

10) **Concerns of the Board:** **Chairman Hurd** asked for concerns of the board. **Schrom** mentioned the article in the headlight Herald about the Tillamook Associations Committee. **Hurd** was present at the meeting and spoke about it. There was discussion of how to get more word out about TURA and what they do.

Agency Board Members:

Don Hurd: Chairman; Vice Chair; Carolyn Decker
 Joe Martin, John Sandusky, Alene Allen, Lynda Casey, Dave Schrom
 Administrator: Paul Wyntergreen, Executive Assistant: Debbi Reeves

Martin commented he has asked **Councilor Davy** if she would be interested in taking his council position on the TURA board. Because of medical reasons, he does not feel he can stay on the board. **Davy** is out of the country at this time but he will let the board know her answer. He will have to take this before the City Council for consideration.

Wyntergreen mentioned the handout of the City Planner monthly report requested by **Decker**.

Reeves asked the board if the new CPA's could be allowed to log onto the TLC Credit Union website to obtain the balances of the loans for the information that needs to be included in the monthly financial statement. She explained this is information she has been providing but it would be easier for them to view the information. She also explained there would be no security issues. Consensus of the board was to allow this.

- 11) **Meetings:** The next regular TURA meeting is September 14, 2011 at 5:30 p.m.
- 12) **Adjournment:** **Chairman Hurd** adjourned the meeting at 7:40 P.M.

Prepared by:
Debbi Reeves
Administrative Assistant

Reviewed by:

Don Hurd – Chairman

1:06 PM
 September 12, 2011
 Cash Basis

Tillamook Urban Renewal Agency
Check Report
 September 1 - 14, 2011

<u>Date</u>	<u>Num</u>	<u>Name</u>	<u>Memo</u>	<u>Split</u>	<u>Paid Amount</u>
Sep 1 - 14, 11					
9/7/2011	569	Northwest Awning & Sign Inc	70100 Beal Building Facade Grant	70100 · Streetscape Beautification	-3,000.00
9/14/2011	570	Tillamook PUD	70106 Electrical - 1st St Parking Lot	70106 · Project Fees	-43.19
9/14/2011	571	TLC Federal Credit Union	70148 LOC #148 Interest	70148 · TLC Loan #148 3rd St Engine...	-867.37
9/14/2011	572	TLC Federal Credit Union	70151 LOC #150 Interest	70151 · TLC Loan #151 Parking Lot	-317.19
9/14/2011	573	Tillamook County Quilt Trails	70100 Quilt Trail Brochures	70100 · Streetscape Beautification	-3,000.00
9/14/2011	574	Jeannette M Launer Attorney	62140 Legal Services Aug 2011	62140 · Legal Services	-180.00
9/14/2011	575	Coast Printing	65040 Beals Building Project	65040 · Office Supplies	-4.70
9/14/2011	576	Bryan P. Fitzsimmons CPA	62100 Financial Services July 2011	62142 · Financial/Audit Service	-750.00
9/14/2011	577	City of Tillamook	62145 Web Service August 2011	62145 · Internet Web Services	-42.30
9/14/2011	578	CNA Surety	65040 Bond Insurance	65040 · Office Supplies	-573.00
9/14/2011	579	Tillamook County Assessor	62141 Plan Amendment Research fee	62141 · Consulting Fees	-25.00
9/14/2011	580	Tillamook County Clerk	70106 Beal Building Recording Fees	70106 · Project Fees	-107.00
Sep 1 - 14, 11					-8,909.75

TILLAMOOK COUNTY PUBLIC WORKS

503 MAROLF LOOP
 TILLAMOOK, OR 97141
 (503) 842-3419 Fax (503) 842-6473
 pubwks@co.tillamook.or.us

STATEMENT

Date Printed: 9/7/2011
 Customer Acct: 200
 Payment Terms: 30 days

Tillamook Urban Renewal Agency
 210 Laurel Avenue
 Tillamook,, OR 97141

Ship To:

Invoice#	Invoice Date	Description	Invoice Total	Invoice Balance
0907111498	09/07/2011	NW Engineers Invoice #1307 reimbursement	\$18,861.35	\$18,861.35
		Payment Date	Check #	Amount
				\$0.00
Invoice Activity Sub-Totals			\$0.00	\$18,861.35
Credits			Check #	Check Amount
			Total Credits	Remaining Balance
				\$0.00
Total Balance Due				\$18,861.35

TILLAMOOK COUNTY PUBLIC WORKS

503 MAROLF LOOP

TILLAMOOK, OR 97141

(503) 842-3419

Fax: (503) 842-6473

pubwks@co.tillamook.or.us

INVOICEInvoice #: **0907111498**

Date Printed: 9/7/2011

Customer Acct: 200

Payment Terms: 30 Days

Tillamook Urban Renewal Agency

210 Laurel Avenue

Tillamook, OR 97141

Date	Qty.	UOM	Description	Unit Price	Amount
9/1/2011	1	Each	NW Engineers Invoice #1307 reimbursement	\$18,861.35	\$18,861.35
Total:				\$18,861.35	

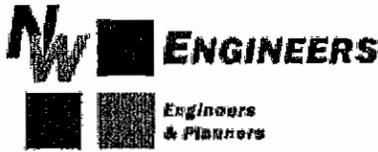
Peggy Weitman

From: Greg Thiel [GregT@nw-eng.com]
Sent: Wednesday, September 07, 2011 7:22 AM
To: Peggy Weitman
Cc: Liane Welch
Subject: FW: Message from KMBT_C352-3rd Street invoice
Attachments: SKMBT_C35211090619270.pdf

Here is our invoice for August. Work included completing ODOT plan revisions, specification revisions per now boiler plate ODOT email, changing bus turnout and adding wall and fence/gate. Also responded to ODOT review questions on storm drainage study and pavement design. Right of Way Associates continued with appraisals and App. Reviews, --now will begin final negotiations. Survey work included finalizing all of right of way exhibits including revised bus lane easements/exhibits. Also included filing fee to Tillamook County for easement map.

Please call me with any questions on this. Thank you.

Greg Thiel

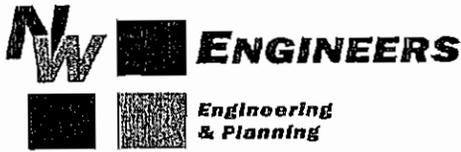


Greg Thiel, PE
 Principal
 Cell 503.913.8098
gregt@nw-eng.com
www.nw-eng.com

NW Engineers, LLC
 19075 NW Tanasbourne Drive, Ste 160
 Hillsboro, Oregon 97124
 T 503.601.4401
 F 503.601.4402

This message is intended for the sole use of the individual to whom it is addressed. It may contain information that is privileged, confidential or exempt from disclosure under applicable laws. If you are not the intended addressee you are hereby notified that you may not use, copy, disclose, or distribute to anyone this message or any information contained within this message. If you have received this message in error, please immediately advise the sender by replying to this email and delete this message.

Sent: Tuesday, September 06, 2011 12:29 PM
To: gregt@nw-eng.com
Subject: Message from KMBT_C352



INVOICE

Tillamook County
 Attn: Liane Welch
 201 Laurel Avenue
 Tillamook, OR 97141

Invoice No: 9-11 #1307
 Invoice Date: 01-Sep-11
 Due Date: Upon Receipt

Contract: NO151 Tillamook County 3rd Street Design
 For professional services through August 31, 2011

Customer ID: H0039

Billing Summary

Contract Services Time Expense/Costs - NW Engineers, LLC

	Budget	Billed to date	Total
1 <u>Project Management</u>	\$6,650.00	\$6,431.51	\$0.00
2 <u>Survey</u>	\$31,500.00	\$33,452.99	\$0.00
3 <u>Offsite Survey</u>	\$5,250.00	\$5,250.00	\$0.00
4 <u>Geotechnical</u>	\$13,825.00	\$12,781.47	\$0.00
5 <u>Preliminary Civil Engineering</u>	\$26,616.00	\$30,364.14	\$0.00
6 <u>Preliminary Stormwater Engineering</u>	\$17,970.00	\$17,354.35	\$0.00
7 <u>Final Civil Engineering Design</u>	\$13,475.00	\$29,453.35	\$0.00
8 <u>Final Stormwater Design</u>	\$8,985.00	\$13,904.45	\$0.00
9 <u>Cost Estimates</u>	\$3,610.00	\$1,800.00	\$0.00
10 <u>Specification/Bidding Documents</u>	\$8,235.00	\$7,515.00	\$0.00
11 <u>NEPA</u>	\$2,350.00	\$664.13	\$0.00
12 <u>Right of Way Allowance (Includes GRI)</u>	\$12,600.00	\$11,352.66	\$0.00
13 <u>Meetings/Open House</u>	\$10,960.00	\$4,671.73	\$0.00
14 <u>Modification #1</u>	\$10,000.00	\$9,385.00	\$0.00
15 <u>Modification #2</u>	\$2,100.00	\$1,008.00	\$0.00
16 <u>Modification #3 Surveying</u>	\$13,320.00	\$21,162.75	\$1,370.25
17 <u>Modification #3 Right of Way Work</u>	\$227,565.00	\$122,758.00	\$25,857.46
18 <u>Modification #3 Right of Way Drawings</u>	\$3,880.00	\$6,325.00	\$0.00
19 <u>Modification #3 Revise Specifications</u>	\$2,000.00	\$2,125.00	\$2,125.00
20 <u>Modification #3 QDOT Plan Revisions</u>	\$16,000.00	\$29,935.50	\$8,370.00
21 <u>Modification #3 QDOT Meetings</u>	\$3,160.00	\$1,423.13	\$0.00
22 <u>Modification #3 Water Main Additional Section</u>	\$3,160.00	\$3,150.00	\$0.00
Subtotal Time Expense/Costs	\$443,211.00	\$372,268.16	\$37,722.71

Total Invoice **\$37,722.71**

Total Past Due \$ -

Approved By

Greg Thiel
 PROJECT MANAGER

Total Due Now **\$37,722.71**

NW Engineers
 19075 NW Tanasbourne Drive
 Suite 160
 Hillsboro, OR 97124
 Phone (503) 601-4401
 Fax (503) 601-4402

For professional services through August 31, 2011

Billing Detail				
Project Management				
Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager	0	\$125.00	\$0.00
Greg Thiel	Mileage			\$0.00
Greg Thiel	Meals			\$0.00
	Copies and postage			\$0.00
Subtotal				\$0.00
Survey				
Name	Designation	Hours	Rate	Amount
Bayside Surveying	Additional Topo			\$0.00
	5% markup			\$0.00
Subtotal				\$0.00
Offsite Survey				
Name	Designation	Hours	Rate	Amount
Bayside Surveying	Office Site Surveying			\$0.00
	5% markup			\$0.00
Subtotal				\$0.00
Geotechnical				
Name	Designation	Hours	Rate	Amount
Chinook GeoServices	Geotech field work			\$0.00
	5% markup			\$0.00
Subtotal				\$0.00
Preliminary Civil Engineering				
Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager	0	\$125.00	\$0.00
Subtotal				\$0.00
Preliminary Stormwater Engineering				
Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager		\$125.00	\$0.00
Subtotal				\$0.00

NW Engineers
 19075 NW Tanasbourne Drive
 Suite 160
 Hillsboro, OR 97124
 Phone (503) 601-4401
 Fax (503) 601-4402

Final Civil Engineering Design

Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager	0	\$125.00	\$0.00
Matt Clemens	Technician	0	\$90.00	\$0.00
Richard Gitschlag, PE	Engineer	0	\$95.00	\$0.00
	5% markup			\$0.00
Richard Gitschlag, PE	Copying			\$0.00
Richard Gitschlag, PE	Mileage			\$0.00
Subtotal				\$0.00

Final Stormwater Design

Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager	0	\$125.00	\$0.00
Chris Baker	Planning Designer	0	\$90.00	\$0.00
Danelle Isenhardt	Planning Designer	0	\$90.00	\$0.00
Matt Clemens	Technologist	0	\$90.00	\$0.00
Clint Davis	Engineer	0	\$75.00	\$0.00
Clint Davis	Mileage			\$0.00
Subtotal				\$0.00

Cost Estimates

Name	Designation	Hours	Rate	Amount
Matt Clemens	Technician		\$90.00	\$0.00
Subtotal				\$0.00

Specification/Bidding Documents

Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager	0	\$125.00	\$0.00
Danelle Isenhardt	Planning Designer	0	\$90.00	\$0.00
Subtotal				\$0.00

NEPA

Name	Designation	Hours	Rate	Amount
Subtotal				\$0.00

Right of Way Allowance (Includes GRI)

Name	Designation	Hours	Rate	Amount
GRI Invoice Markup				
Subtotal				\$0.00

NW Engineers
 19075 NW Tenasbourne Drive
 Suite 160
 Hillsboro, OR 97124
 Phone (503) 601-4401
 Fax (503) 601-4402

Meetings/Open House

Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager	0	\$125.00	\$0.00
Subtotal				\$0.00

Modification #1

Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager	0	\$125.00	\$0.00
Matt Clemens	Technologist	0	\$90.00	\$0.00
Subtotal				\$0.00

Modification #2

Name	Designation	Hours	Rate	Amount
Bayside Surveying Markup				\$0.00
Subtotal				\$0.00

Modification #3 Surveying

Name	Designation	Hours	Rate	Amount
Bayside Surveying Markup				\$1,305.00
Subtotal				\$65.25
				\$1,370.25

Modification #3 Right of Way Work

Name	Designation	Hours	Rate	Amount
Right of Way Associates Markup-				\$25,475.33
Subtotal				\$382.13
				\$25,857.46

Modification #3 Right of Way Drawings

Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager		\$125.00	\$0.00
Matt Clemens	Technologist	0	\$90.00	\$0.00
Subtotal				\$0.00

Modification #3 Revise Specifications

Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager	17	\$125.00	\$2,125.00
Subtotal				\$2,125.00

NW Engineers
 19075 NW Tanasbourne Drive
 Suite 160
 Hillsboro, OR 97124
 Phone (503) 601-4401
 Fax (503) 601-4402

Modification #3 ODOT Plan Revisions

Name	Designation	Hours	Rate	Amount
Matt Clemens	Technologist	93	\$90.00	\$8,370.00
Greg Thiel	Division Manager	0	\$125.00	\$0.00
Chris Baker	Technologist		\$90.00	\$0.00
Subtotal				\$8,370.00

Modification #3 ODOT Meetings

Name	Designation	Hours	Rate	Amount
Greg Thiel	Division Manager		\$125.00	\$0.00
Matt Clemens	Technologist	0	\$90.00	\$0.00
Mileage-G. Thiel				
Subtotal				\$0.00

Modification #3 Water Main Additional Section

Name	Designation	Hours	Rate	Amount
Matt Clemens	Technologist	0	\$90.00	\$0.00
Subtotal				\$0.00

Project Total

\$37,722.71

NW Engineers
 19075 NW Tanasbourne Drive
 Suite 160
 Hillsboro, OR 97124
 Phone (503) 601-4401
 Fax (503) 601-4402

NOIS1

Invoice

BAYSIDE SURVEYING
 11765 Hwy. 101 South
 Tillamook, OR 97141
 Ph. 503-842-5551
 Fax 503-842-5552

DATE 9/1/2011	INVOICE # 2119
-------------------------	--------------------------

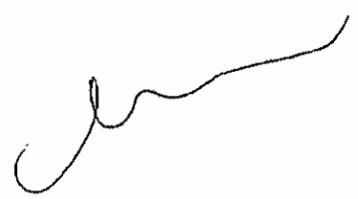
BILL TO
NW Engineers 19075 NW Tansbourne Drive Suite 160 Hillsboro, OR 97124

DUE DATE 9/15/2011

DESCRIPTION	QTY	RATE	AMOUNT
8-3-11 Two man field crew - set pins for bus shelter	4.0	160.00	640.00
8-5-11 PLS - Review and plot map and legal description and turn in to Till. Co. Surveyor	2.0	90.00	180.00
8-29-11 PLS - Deliver copies of two maps and legal descriptions to Till. Co. Road Dept.	1.0	90.00	90.00
File fee to Tillamook County for map	1.0	125.00	125.00
8-31-11 PLS - print out maps for easements and sign and mail to R.O.W. Associates, emails, administration	3.0	90.00	270.00
Payment due upon demand	Total		1,305.00

NW Engineers, LLC
Payables

Project No.	
Fixed Asset	
Acct No.	
Due Date	
QB	
Approved	<i>[Signature]</i>
Date	9/1/11





Right-of-Way Associates, Inc.
 10186 SW Laurel St.
 Beaverton, OR 97005
 Phone: (503) 644-3436 Fax: (503) 644-7400

NW Engineers LLC
 Attn: Greg Thiel
 19075 NW Tanasbourne Dr, Ste 160
 Hillsboro, OR 97124

Handwritten signature

Date: 8/25/2011
INVOICE
 11002-083011-007

Job Number	Project Name	Due Date
11-002	3rd Street Road & Drainage	Net 30 Days
Contract Expiration Date: December 31, 2011		
Services Provided	Amount	
For Direct Costs between 08/01/2011 and 08/30/2011		
3rd Street Road and Drainage	\$	-
Direct Costs:		
Appraisal Field Review - Arvidson & Assoc		6,000.00
Long.14		
Lane.15		
Billow.16		
Wodasky.17		
Degree.27		
Garcia.28		
Goodspeed.30		
Coy.31		
Seeger.50		
Griffeth.51a		
Thompson.53		
Martin.67		
Total Invoice Amount:	\$	6,000.00
Account Status - Summary to Date		
Authorized Limit	\$	224,200.00
Previously Billed	119,256.16	
This Billing	6,000.00	
Total Billings to Date	\$ 125,256.16	
Remaining Funds	\$	98,943.84

NW Engineers, LLC
 Payables

Project No.	
Fixed Asset	
Acct No.	
Due Date	

Handwritten signature: Greg Thiel
5/6/11

Arvidson & Associates Inc
 4535 SW 96t Ave #130
 Beaverton, OR 97005

Invoice

Invoice #: 110713
 Invoice Date: 8/23/2011

Bill To:
 ROWA, Inc.
 10186 SW Laurel St.
 Beaverton, OR 97005

Project:
P.O. Number:

Date	Description	Amount
8/23/2011	Field review of 12 appraisal reports prepared by William Adams, MAI for the "3rd Street Road and Drainage Project" by Tillamook County. Reviewed files are: #14 (Long); #15 (Lane); #16 (Billow); #17 (Wodesky); #27 (Degree); #28 (Garcia); #30 (Goodspeed); #31 (Coy); #50 (Seeger); #51a (Griffeth); #53 (Thompson); and #57 (Martin)	6,000.00

We appreciate your prompt payment.

Total	\$6,000.00
Payments/Credits	\$0.00
Balance Due	\$6,000.00



Right-of-Way Associates, Inc.
 10186 SW Laurel St.
 Beaverton, OR 97005
 Phone: (503) 644-3436 Fax: (503) 644-7400

NW Engineers LLC
 Attn: Greg Thiel
 19075 NW Tanasbourne Dr, Ste 160
 Hillsboro, OR 97124

Date: 8/30/2011
INVOICE
 11002-083011-008

Job Number	Project Name	Due Date
11-002	3rd Street Road & Drainage	Net 30 Days
Contract Expiration Date: December 31, 2011		
Services Provided	Amount	
For Direct Costs between 08/01/2011 and 08/30/2011		
3rd Street Road and Drainage	\$	-
Direct Costs:		
Appraisal Field Review - Arvidson & Assoc		-
Brennan.32		500.00
Pickett.33		500.00
Brown.34		500.00
White.37		500.00
Weber-Skopin.39		500.00
Jones.43		500.00
Thompson.44		500.00
Wilks.45		500.00
Priss.48		500.00
Bristow.49		500.00
Tillamook School Dist.58		1,000.00
Real Estate Appraisal & Consultation		
Completion of Appraisal - Tillamook School District.58		4,000.00
Total Invoice Amount:	\$	10,000.00
Account Status - Summary to Date		
Authorized Limit	\$	224,200.00
Previously Billed		125,256.16
This Billing		10,000.00
Total Billings to Date	\$	135,256.16
Remaining Funds	\$	88,943.84

NW Engineers, LLC
 Payables

Project No.	
Fixed Asset	
Acc't No.	
Due Date	
QB	
Approved	<i>[Signature]</i>
Date	8/6/11

Arvidson & Associates Inc
 4535 SW 96t Ave #130
 Beaverton, OR 97005

Invoice

Invoice #: 110714
Invoice Date: 8/29/2011

Bill To:
 ROWA, Inc.
 10186 SW Laurel St.
 Beaverton, OR 97005

Project:
P.O. Number:

Date	Description	Amount
8/29/2011	Review of 11 appraisal reports prepared by William Adams, MAI for the "3rd Street Road and Drainage Project" by Tillamook County. Reviewed files are: #32 (Brennan); #33 (Pickett); #34 (Brown); #37 (White); #39 (Skopin); #43 (Jones); #44 (Thompson); #45 (Wilks); #48 (Priss); #49 (Bristow); #58 (Tillamook School Dist. #9) 10 Reviews @ \$500 1 Review @ \$1,000	6,000.00

We appreciate your prompt payment.

Total	\$6,000.00
Payments/Credits	\$0.00
Balance Due	\$6,000.00

◆ **William E. Adams, MAI** ◆
Real Estate Appraisal & Consultation
1809 Sunburst Terrace NW
Salem, OR 97304
Tel: (503) 585-6656
Fax: (503) 585-6444
Email: 1billadams@comcast.net

August 23, 2011

Right-of-Way Associates, Inc.
10186 SW Laurel Street
Beaverton, OR 97005

Purchase Order No.: n/a
Project: Tillamook 3rd Street Project

Our File No.: 110501
Federal I.D. No.: 20-8966410

Appraisal Service(s) Rendered: Preparation of Summary appraisal reports estimating Just Compensation for the acquisition of partial takings. This invoice covers completion of the Tillamook School District report.

Completed Appraisal File: School District (Parcel #58)	\$4,000
Balance Due:	\$4,000

Balance Due upon Receipt of Invoice

Invoice

THIRD STREET DESIGN CONTRACT WITH NW ENGINEERS			
COUNTY PORTION	\$11,000.00	(our portion was paid on 8/3/10 payment)	
TURA PORTION	<u>\$151,026.00</u>		
TOTAL CONTRACT AMOUNT	\$162,026.00		
Change Order # 1	\$10,000.00		
Change Order # 2	\$2,100.00	\$174,126.00	
Change Order #3	\$269,085.00	TURA will pay \$133,000 and County will pay \$136,085.00	
TOTAL WITH CHANGES	\$443,211.00		
7/10/2010	Invoice #1126	18,109.85	County paid \$11,000 TURA paid \$7,109.85
8/10/2010	Invoice #1130	28,699.67	
9/30/2010	Invoice #1156	21,365.56	
11/1/2010	Invoice #1174	25,675.90	
12/1/2010	Invoice #1184	28,216.43	
1/3/2011	Invoice #1200	18,477.75	
2/1/2011	Invoice # 1192	17,092.03	
3/1/2011	Invoice #1199	10,491.89	
4/1/2011	Invoice #1228	5,996.92	last payment on \$174,126.00 Portion
4/1/2011	Invoice 1228	7,567.11	First payment on \$269,085.00 will divide 50% each agency
5/3/2011	Invoice #1247	24,314.00	50% each agency
6/1/2011	Invoice #1272	36,801.64	50% each agency
6/30/2011	Invoice #1281	25,205.25	50% each agency
7/31/2011	Invoice #1291	30,588.38	50% each agency (only paid \$15,294.19 owe \$15,294.19)
8/12/2011	Invoice #1302	37,449.31	50% each agency
9/1/2011	Invoice #1307	37,722.71	50% each agency
Paid to Date		373,774.40	
Balance on Contract		\$69,436.60	

ENGINEERING COSTS & ROW COMPENSATION PAID BY THE		
	COUNTY	
ROW COMPENSATION		\$27,000.00
ENVIRONMENTAL		\$17,898.00
HISTORICAL		\$9,200.00
	TOTAL	\$54,098.00

Starting 4/1/11 \$269,085.00 bills will be divided 50% to each agency			
	TURA	COUNTY	
	133,000.00	136,085.00	
	3,783.56	3,783.56	4/1/2011
	12,157.00	12,157.00	5/3/2011
	18,400.82	18,400.82	6/1/2011
	12,602.62	12,602.63	7/5/2011
	15,294.19	15,294.19	8/2/2011
	18,724.65	18,724.66	8/15/2011
	18,861.35	18,861.36	9/7/2011
	99,824.19	99,824.22	Paid to Date
	33,175.81	36,260.78	Balance

TURA REIMBURSEMENT

DATE BILLED	AMOUNT	DATE RECEIVED
8/3/2010	\$7,109.85	9/2/2010
9/1/2010	\$28,699.67	9/13/2010
10/6/2010	\$21,365.56	10/29/2010
11/1/2010	\$25,675.90	11/15/2010
12/1/2010	\$28,216.43	12/29/2010
1/3/2011	\$18,477.75	1/18/2011
2/3/2011	\$17,092.03	2/28/2011
3/1/2011	\$10,491.89	3/22/2011
4/1/2011	\$9,780.48	4/27/2011
5/3/2011	\$12,157.00	5/24/2011
6/1/2011	\$18,400.82	6/13/2011
7/5/2011	\$12,602.62	7/20/2011
8/2/2011	\$15,294.19	8/18/2011
8/15/2011	\$18,724.65	8/29/2011
9/7/2011	\$18,861.36	
Total TURA Reimbursement	\$262,950.20	

Memorandum



To: TURA Board of Directors
From: Debbi Reeves, Executive Assistant
Date: 9/7/2011
Re: 3rd Street Engineering Line of Credit

The date on the 3rd Street Engineering Line of Credit (LOC) at TLC Credit Union has been extended until March 2012 to give time for the completion of the engineering part of the project. TLC has a policy to issue a LOC for a period of 1 year at which time the LOC is rolled into a term loan or paid off. Chairman Hurd and I asked TLC to consider an extension for 3 to 6 months and the request was granted for 6 months.

Please let us know if you have any further questions. Thank you.



David Mast
160 Bayocean Road
Tillamook OR. 97141
503-815-2599
dmast48@embarqmail.com
August 28, 2011

Don Hurd
Tillamook Urban Renewal Agency
Tillamook City Hall
210 Laurel Avenue
Tillamook OR 97141

Dear Mr. Hurd:

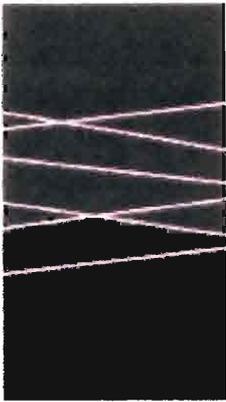
We have serious health concerns with the proposed transmission line from Tillamook to Oceanside. The articles we read increased our concerns (attached). We do not believe it is wise or sensible to site this line on a route through Tillamook. The proposed route is closer to many homes and businesses than the 400 to 500 foot corridors that are recently being recommended for residential areas and substation power lines.

Scientists are beginning to recommend that power companies use "prudent avoidance" in their route selection. In a county that is as rural as Tillamook County, there is no reason to put a power line on residential property. We are not opposed to PUD developing a transmission line to Oceanside, however they must come up with a better route that meets the needs of the county and does not expose people to 115 kV transmission lines 24 hours per day 7 days a week.

Sincerely,

A handwritten signature in blue ink that reads "David Mast". The signature is written in a cursive style.

David Mast



SHORT FACTSHEET ON EMF

The use of electricity is taken for granted, but people are still concerned about whether powerlines and appliances are safe or unsafe. Here are answers to some common questions about electric and magnetic fields. See also our Web site at <http://www.dhs.ca.gov/ps/deodc/ehib/>

What are electric and magnetic fields and why do people get concerned about them?

Electric and magnetic fields are a basic force of nature (like gravity), generated by electricity. They are found almost everywhere. Electric and magnetic fields are found in nature, where they are created by such things as lightning and static electricity. Man-made fields are found wherever people use electricity, such as near powerlines and electrical appliances. Like sound, electric and magnetic fields are made of a mixture of components and so can be described in many different ways. Both have wave-like properties such as strength and “frequency” (how often they cycle back and forth). Sound can be loud (strong) or soft (weak), high or low pitched (different frequencies), suddenly loud or constant in tone, and pure or jarring. Similarly, electric and magnetic fields are a mixture of components. They can be strong or weak, have a high or low frequency, have sudden increases in strength (“transients”) or a constant strength, and consist of one pure frequency or several (called “harmonics”). For example, the *strength* of a field can be weak and constant, as in most nighttime home environments, or it can be strong and vary from high to low every few seconds, as from an electric blanket set on high.

Powerlines and wiring in buildings and appliances generate 50 and 60 Hertz fields, sometimes referred to as “power frequency” fields. Hertz is the unit for measuring the frequency of fields in the number of wave cycles each second. The lower the frequency of a field, the lower its energy. Power frequency fields are low frequency fields and have low energy levels. Microwave and x-ray fields are high frequency fields and have high energy levels.

Early scientific studies found a link between increased rates of cancer and closeness to certain kinds of powerlines that can cause strong magnetic fields. Over the last two decades concern about the health effects of electric and magnetic fields has increased.

What are the EMF sources in my life?

We are exposed to EMF from many sources, including high voltage transmission lines (usually on metal towers) carrying electricity from generating plants to communities, and distribution lines (usually on wooden telephone poles) that bring electricity to our homes, schools and workplaces. We are also exposed to magnetic fields from wiring in buildings and from all our electric appliances, like TV sets, radios, hair dryers, electric blankets and electric tools.

Most of the fields we experience in a day come from sources other than powerlines, such as wiring and appliances in homes or workplaces. The strength of both electric and magnetic fields decreases as you move away from their source, just as the heat from a campfire decreases with distance. For both electric and magnetic fields strength decreases more quickly with distance from “point” sources like appliances than from “line”

CALIFORNIA ELECTRIC AND MAGNETIC FIELDS PROGRAM

A project of the California Department of Health Services and the Public Health Institute



Gray Davis
Governor
State of California

Grantland Johnson
Secretary
Health and Human Services Agency

Diana M. Bontá, R.N., Dr.P.H.
Director

Department of Health Services

sources such as powerlines. For example, the magnetic field is down to “background levels” (the naturally occurring amounts) at 3 or 4 feet away from an appliance (*table 1*). It reaches background levels around 60 to 200 feet from a distribution line and about 300 to 1000 feet from a transmission line.

In spite of these similarities, electric fields and magnetic fields have somewhat different properties and possibly different ways of influencing our bodies. Electric fields can be shielded or weakened by

Table 1. Examples of magnetic fields at particular distances from appliance surfaces.

	MILLIGAUSS (mG)	
	at 1 foot	at 3 feet
aquarium pump	0.35-18.21	0.01-1.17
band saw	0.51-14.24	0.05-0.75
can opener	7.19-163.02	1.30-6.44
clock	0.34-13.18	0.03-0.68
clothes iron	1.66-2.93	0.25-0.37
coffee machine	0.09-7.30	0-0.61
computer monitor	0.20-134.7	0.01-9.37
copier	0.05-18.38	0-2.39
desktop light	32.81	1.21
dishwasher	4.98-8.91	0.84-1.63
drill press	0.21-33.33	0.03-8.35
fax machine	0.16	0.03
food processor	6.19	0.35
garbage disposal	2.72-7.79	0.19-1.51
hairdryer	0.1-70	0.1-2.8*
microwave oven	0.59-54.33	0.11-4.66
mixer	0.49-41.21	0.09-3.93
portable heater	0.11-19.60	0-1.38
printer	0.74-43.11	0.18-2.45
portable fan	0.04-85.64	0.03-3.12
radio	0.43-4.07	0.03-0.98
range	0.60-35.93	0.05-2.83
refrigerator	0.12-2.99	0.01-0.60
scanner	2.18-26.91	0.09-3.48
sewing machine	3.79-7.70	0.35-0.45
tape player	0.13-6.01	0.01-1.66
television	1.80-12.99	0.07-1.11
toaster	0.29-4.63	0.01-0.47
vacuum	7.06-22.62	0.51-1.28
VCR	0.19-4.63	0.01-0.41
vending machine	0.46-5.05	0.02-0.59

L. Zaffanella, School Exposure Assessment Survey, California EMF Program, interim results, Nov. 1997

trees, buildings and even human skin, but magnetic fields are not so easily blocked. Most recent studies have focused on the health effects of magnetic fields

because they are not readily shielded and are easier to measure than electric fields.

What kind of scientific studies have been done.

Nobody knows for sure whether exposure to 50 and 60 Hertz fields is a health risk. Three kinds of studies have been done to explore this:

- 1) laboratory studies that expose human or animal cells or organs to fields, looking for biological changes
- 2) laboratory studies that expose animals to fields, looking for changes in body function, chemistry, behavior or general health
- 3) “epidemiological” studies that observe people’s health and evaluate whether groups that have high or unusual EMF exposure have a greater chance for developing a disease like cancer than groups with “normal” or usual exposures

What do these studies show?

First, *these studies do not show a clear pattern of health hazards*. Some but not all animal and cell studies have shown biological changes linked with *magnetic field* exposure. However, it is not clear whether these biological changes would be the same in humans. Second, it is not clear which component (frequency, strength, harmonics, etc.) of magnetic field exposure might be hazardous.

Concern about possible health hazards from electric power use is supported by results of some scientific studies, but the evidence they provide is still incomplete and inconclusive and even, in some cases, contradictory. A good deal of research is underway to help resolve these questions and uncertainties. Most but not all epidemiological studies show an association between leukemia (a type of cancer) and an “indirect” estimate of high magnetic field exposure such as living very near a type of powerline that could cause of high magnetic fields or working where there is high electrical exposure. These estimates may not really represent a person’s true exposure at the critical time period when they may have started developing an illness. Also, these studies show that some estimates of magnetic field exposure might be *related* to cancer, but this does not necessarily mean

that magnetic fields *cause* cancer. Indirect ways of estimating exposure may unintentionally include other risk factors like chemicals used at work or living in a particular neighborhood.

The California Department of Health Services measured the strength of magnetic fields in the bedroom, family room, and kitchen and at the front door of some San Francisco Bay Area houses. Any appliances or electrical devices that were on at the time were left on. As shown in *table 2*, about half of the houses had an average magnetic field level below 0.71 milligauss (mG, the basic unit for measuring magnetic field strength), and 90% of homes had levels below 1.58 mG.

These are measures of the average strength of the 60 Hertz frequency magnetic field at a particular day and time. Field strengths vary with time, day and season depending on electricity use. For example,

Table 2. Distribution of average magnetic field strength of San Francisco Bay Area homes.

homes below average field strength	736 homes measured ¹
10%	0.43 mG
25%	0.54 mG
50%	0.71 mG
75%	0.98 mG
90%	1.58 mG

¹Lee, G., California Exposure Assessment study (preliminary findings). California EMF Program. 1996.

dinnertime readings are often higher than the middle of the night because appliances are in use. The other magnetic field components (like harmonics of other frequencies and short bursts of stronger fields called transients) are not included in these measurements, so they do not describe other aspects of the fields or other frequencies. Also, the field strength may change over time or distance depending on the location and type of its source.

Fairly simple measurements made by a trained technician can show the main indoor or outdoor sources of elevated magnetic fields in a home. Many utility companies and several private businesses can take these measurements. Taking measurements at different distances from powerlines can help show

if the lines are sources for elevated magnetic fields inside a home. Turning off the house's main power switch will rule out sources caused by power use inside. In most cases it is possible to find and correct the source of elevated fields if they are due to faulty wiring, grounding problems or choice of lighting fixtures.

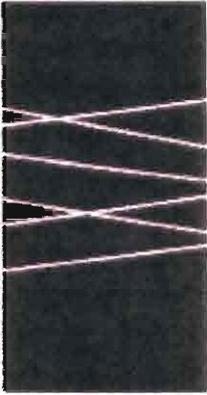
The State of California

The California Department of Education enacted regulations that require minimum distances between a *new school* and the edge of a transmission line "right-of-way," or the area immediately surrounding lines that utility companies need to access the lines for maintenance and repairs. The setback distances are 100 feet for 50-133 kV lines, 150 feet for 220-230 kV lines, and 350 feet for 500-550 kV lines. These distances were not based on specific biological evidence, but on the known fact that the strength of electric fields from powerlines drops to near background levels at the specified distances, given that no other major sources are present.

In 1993, the California Public Utilities Commission (CPUC) authorized the state's investor-owned utilities to carry out "no and low cost EMF avoidance and measures" in construction of new and upgraded utility projects. The CPUC also established our California EMF research, education, and technical assistance program under the guidance of the Department of Health Services. This program will provide information to assist those responsible for making public policy. However, at present the state of California has no formal rules or guidelines, but advocates "no and low cost" of EMF. This means minimizing EMF exposure when it is easy and inexpensive to do so. Right now there is not enough evidence to justify making regulations governing EMF.

The Federal Government

At the Federal level, the Federal Energy Policy Act of 1992 included a five-year program of electric and magnetic field (EMF) Research and Public Information Dissemination (EMF-RAPID). The EMF-RAPID Program asked these questions: Does exposure to EMF produced by power generation, trans-



mission, and use of electric energy pose a risk to human health? If so, how significant is the risk, who is at risk, and how can the risk be reduced?

In 1998, a working group of experts gathered by the EMF-RAPID Program met to review the research that has been done on the possible health risks associated with EMF. This group reviewed the studies that have been done on the subject, and then voted on whether they believed that exposure to EMF might be a health risk. They then published a report describing their findings. A majority of the scientists on this working group voted that the epidemiology studies of childhood leukemia provide enough evidence to classify EMF as a "possible human carcinogen." This means that, based on the evidence, these researchers believe that it is possible that EMF causes cancer, but they are not sure. They also decided that they did not have enough evidence to determine whether EMF exposure might cause other diseases.

The EMF-RAPID Program released its final report to Congress in 1999. This report explains the program's findings, including the results of its working group and many research projects. The final report states that "the NIEHS believes that there is weak evidence for possible health effects from [power frequency] ELF-EMF exposures, and until stronger evidence changes this opinion, inexpensive and safe reductions should be encouraged." (page 38) For more information on the EMF-RAPID program, or to look at these reports, contact the EMF-RAPID Program, National Institute of Environmental Health Sciences, National Institutes of Health, P.O. Box 12233, Research Triangle Park, North Carolina 27709, or visit their Web site at <http://www.niehs.nih.gov/emfrapid>. When ordering a copy of the final report, refer to the NIH publication number 99-4493.

Until we have more information, some communities and individuals are adopting the "no and low cost" avoidance strategy. It's easy to move an electric clock a few feet away from a bedside table, and it's simple to sit further away from the computer monitor. Table 1 above shows how quickly EMF decreases as you move away from an appliance. It almost disappears at distances of 3 to 5 feet. It is possible to take measurements in your home to identify sources of EMF, including faulty electrical wiring that can produce elevated magnetic fields and electrical shock. In California, the Public Utilities Commission requires investor-owned utilities to provide magnetic field measurements at no charge to their customers.

Contact us for a more detailed long factsheet. Please send us your questions and comments, too.

CALIFORNIA ELECTRIC AND MAGNETIC FIELDS PROGRAM

A project of the California Department of Health Services and the Public Health Institute

(510) 622-4500 fax (510) 622-4505
Elihu Harris State Office Building
1515 Clay St., 17th Floor
Oakland, CA 94612
<http://www.dhs.ca.gov/ps/deodc/ehib/>

The California EMF Project

TEXT SIZE: A|A|A

In 1993, the California Public Utilities Commission (CPUC) issued decision D.93-11-013.

- [D.93-11-013](#)
- Established the California EMF program of research and information managed by the California Department of Health Services (CDHS) and funded by utility ratepayers.
 - [California EMF program](#)
- Set **current** [California EMF policy](#).
- Directed California's regulated electric utilities to:
 - Take no-cost and low-cost measures to reduce EMF levels when utilities design new projects or upgrade existing facilities. The CPUC did not set specific reduction levels for EMFs, considering it inappropriate to set a specific numerical standard until a scientific basis for doing so exists.
 - Develop EMF design guidelines for implementing the no-cost and low-cost measures.
 - Implement uniform workplace and residential EMF measurement programs.
 - Provide **credible, meaningful, consistent and timely** EMF information to utility customers, employees and the public.

The purpose of the [California EMF Program](#) was to perform EMF research and policy analysis, and provide education and technical help to benefit Californians. Input to the CDHS was provided by a Stakeholders Advisory Consultant Group consisting of representatives of the public, consumer groups, health and scientific experts, and labor and utility representatives.

- [California EMF program](#)

In October 2002, the CDHS issued its final report, *An Evaluation of the Possible Risks From Electric and Magnetic Fields (EMFs) From Power Lines, Internal Wiring, Electrical Occupations and Appliances*. Fundamentally, the report agrees with other national and international agency evaluations in finding that an EMF health risk has not been scientifically demonstrated, although the possibility of a small risk cannot be ruled out. The CDHS report is controversial because of the increased likelihood it places on the possibility of an actual EMF risk.

- [Evaluation of possible risks](#)

In August 2004, the CPUC issued an Order Instituting Rulemaking (OIR R.04-08-020) to determine whether improvements should be made to its existing EMF rules and mitigation policy and/or the implementation of the

policy.

The schedule and scope of the OIR proceeding was determined in March 2005, and in January 2006, the CPUC issued Decision 06-01-042 that updated its EMF Policy.

- [Decision 06-01-042](#)
- Health hazards from exposures to EMF have not been established;
- State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate.
- Existing no-cost and low-cost precautionary-based EMF policy should be continued.

The decision also:

- Adopted "rules and policies to improve utility design guidelines for reducing EMF" and provided for a utility workshop "to implement these policies and standardize design guidelines."
- Ordered electric utilities to file revised design guidelines within six months of the effective date of the decision.
- Directed the CPUC's "Energy Division to monitor and report on new EMF related scientific data as it becomes available."

After a series of workshops held in the spring of 2002, SDG&E and other California electric utilities agreed on a standardized EMF Design Guidelines document. SDG&E filed its revised EMF Design Guidelines for Electrical Facilities with the CPUC in July 2006.

- [Standardized design guidelines](#)

Additional Information

- [CDHS—General EMF Information](#)
- [CDHS Home Page](#)
- [CPUC Home Page](#)
- [CPUC Decision D.93-11-013](#)
- [CPUC OIR R.04-08-020](#)

Last updated: January 26, 2009

Power Line Health Facts

...information for the concerned

Home

EMF

Meters

Search

Contact Us

FAQ



More EMF Evidence • Specific Diseases • Expert Opinions • International • Property Values • Other Sources

- ◊ Introduction
- ◊ Major Findings
- ◊ Other Findings
- ◊ Specific Results
- ◊ Studies Need

Summary

Magnetic fields **likely cause** childhood and adult leukemia, adult brain cancer, spontaneous abortions, and ALS.

They **possibly cause** childhood brain cancer, female and male breast cancer, Alzheimer's disease, suicide, and heart problems.

"Even a slight additional lifetime risk could be of concern to regulators, who already regulate other environmental concerns that convey even lower risks."

The California EMF Project Findings

Note: This is an analysis of the draft report. An analysis of the final report is forthcoming shortly.

Since 1993, the California Department of Health Sciences has led a project initiated by the California Public Utilities Commission titled "The California EMF Project." The project cost \$7 million, and is now complete.

As part of this project, the Department of Health Sciences initiated new studies and reviewed the literature.

Here is our analysis of its findings.

Introduction

The Evaluation does not specifically incorporate studies published after its cutoff date of June 24, 2000. Research produced after the deadline include the *British Journal* study in which the authors of the major previous studies reversed their previous findings, the Washington State study finding a five-fold increase in childhood leukemia, and the German study finding children exposed in their bedrooms to high magnetic fields are particularly likely to develop childhood leukemia.

Nevertheless, even without these studies, the Evaluation is valuable because it reflects the considered opinion of health experts derived after a long period of research.

It evaluates the risks associated with EMF based upon a new measure, *causation*. Heretofore major reviews usually have asked if there is an *association* between EMF and various diseases. It is possible to have an association without a cause/effect relationship. The association could be coincidental. It could appear to exist when it does not because of study errors. An association might exist but be of little analytical significance because of confounding factors like pollution or level of income.

The causation standard is more rigorous because it demands the cause effect finding, and mandates that there is no evidence of bias, errors, or confounding factors.

Major Findings

Magnetic fields **likely cause** childhood and adult leukemia, adult brain cancer, spontaneous abortions, and ALS.

They **possibly cause** childhood brain cancer, female and male breast cancer, Alzheimer's disease, suicide, and heart problems.

They are unlikely to universally impact all types of cancer or reproductive failures other than spontaneous abortions

There is insufficient information to determine if magnetic fields cause clinical depression.

Associated Findings

Animal studies show that magnetic fields at low intensities have profound effects on selective biological organisms.

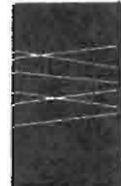
The report finds that, with respect to the diseases possibly or likely caused by EMF "even a slight additional lifetime risk could be of concern to regulators, who already regulate other environmental concerns that convey even lower risks."

The report notes a full mechanistic understanding does not now exist to explain why EMF could cause serious disease. The report goes on to note, however, "The lack of mechanistic understanding is initially ... common in harmful agents."

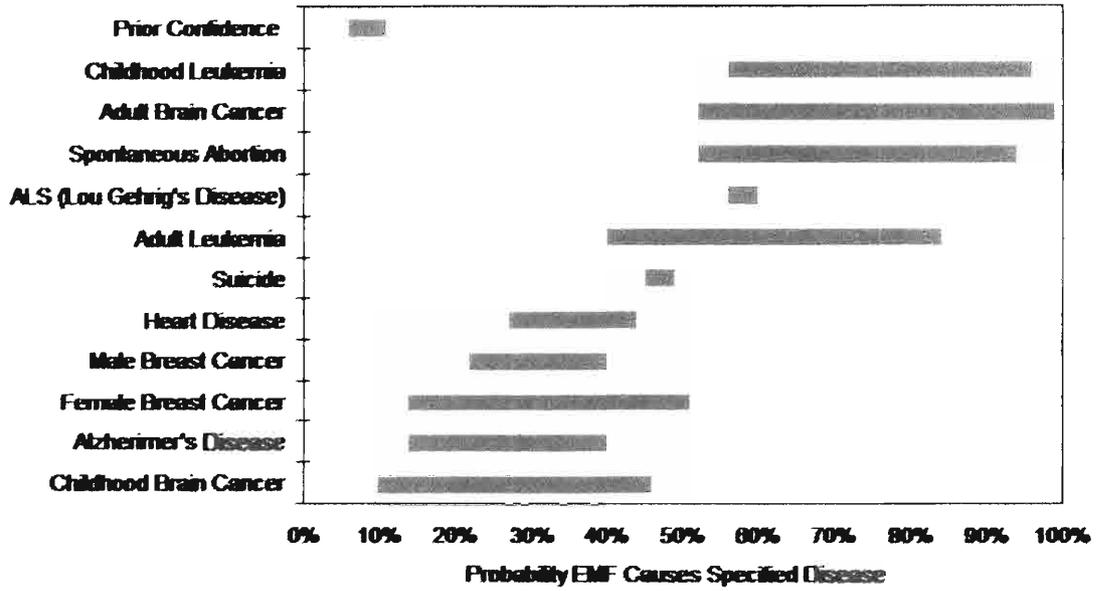
Once the benchmark 2 to 16 mG intensities of EMF are passed, risks do not appear to increase substantially as EMF increases.

Specific Results

The following graph shows the Project's range of the estimates of probabilities that EMF causes specific diseases. "Prior confidence" is the researchers' estimate of the overall disease probability assigned before learning about the recent research results.



California
EMF
Program



The Need for New Studies

Funding for magnetic field research has declined dramatically in the last few years. In particular, in spite of the utilities industries call for more research, research on magnetic fields by the utilities' research arm, the EPRI, has declined to one-third of its level three years ago.

Table of contents

Power Line Health Facts

...information for the concerned

[Home](#)
[EMF](#)
[Meters](#)
[Search](#)
[Contact Us](#)
[FAQ](#)


[More EMF Evidence](#) ♦ [Specific Diseases](#) ♦ [Expert Opinions](#) ♦ [International](#) ♦ [Property Values](#) ♦ [Other Sources](#)

Summary

Recent studies demonstrate beyond any reasonable doubt that there is a strong statistical association between exposures to magnetic fields of intensities greater than 4 mG and an increase risk of contracting a number of deadly diseases.

The California Department of Health concludes it is likely that this statistical association is due to the fact that the magnetic fields cause the deadly diseases.

A major new study published in the British Medical Journal looked at cancer data in England and Wales between 1962 and 1995, for children aged up to 15 years old. The study found that children whose birth address was within 200 meters of an overhead power line had a 70% increased risk of leukemia.

(See above links for more information)

[New information on EMF](#)

Introduction

When properly analyzed, scientific data convincingly and consistently show a link between magnetic fields greater than 2-4 mG and cancer. New analyses of older data have induced a **wholesale revision in the views** of high-level authorities, including the utilities themselves, who have dramatically revised their own statements on EMF.

Therefore, the information on this site is focuses primarily on "Recent Studies," which were published after September 2000, and does not cover earlier studies, which do not incorporate the recent revisions in the findings.

Recent Studies

- ▶ A major new study found that children whose birth address was within 200 meters of an overhead power line had a 70% increased risk of leukemia. Children living 200 to 600 meters away from power lines had a 20% increased risk. This indicates the danger from power lines is appreciably further from the lines than had been identified in previous studies. The study, which was partially funded by the power-line industry, mapped how far each child lived from a high voltage overhead power line. It compared the children who had cancer with a control group of 29,000 children without cancer, but who lived in comparable districts, Appearing in the June 2005 British Medical Journal, the study concludes there is a statistical link between EMF from power lines and leukemia. The study – a collaboration between the Childhood Cancer Research Group at the University of Oxford and National Grid owners, Transco – looked at cancer data or children aged up to 15 years old in England and Wales between 1962 and 1995. [\[Related Press Report\]](#)

- ▶ A Connecticut law requires the Connecticut Siting Council to include health and fair market value issues when deciding on the application to expand and build 345-kilovolt lines. [Here is the rationale for the law.](#) As a followup, the Council study shows that [burying long lines is feasible.](#)

- ▶ Based on experiments involving rats and ozone, scientists at the Pacific Northwest National Laboratory have identified a chemical reaction that may explain higher rates of illness observed= among some people exposed to strong electromagnetic fields such as those produced by high-voltage power lines.

- ▶ A California Department of Health Sciences Evaluation concludes EMFs **"can cause** some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig's Disease, and miscarriage" [emphasis added]. The Evaluation—which is the culmination of a 9 year, \$7 million research effort—further concludes that magnetic fields **may cause** suicide and adult leukemia. The Final Evaluation is dated June 2002, but was only released about October 13, 2002. The Final Evaluation uses as a standard **causation**, which is a more rigorous test than the more common standard that seeks to demonstrate of an *association* between EMF and many of these diseases. Here is an [analysis of this important report.](#) In addition, the California Health Department also produced a relatively short analysis of the [policy options implied by the Evaluation.](#) The Department discusses the policy implications of its analysis it a [separate report.](#)

Even though the incidence of all these diseases (except miscarriages) is low, the California Department concludes EMF represents a significant health risk. "[I]f EMFs do contribute to the cause of these conditions, even the low fractions of attributable cases and the size of accumulated lifetime risk of

highly-exposed individuals could be of concern to regulators. Indeed, when deemed a real cause, estimated lifetime risks smaller than these...have triggered regulatory evaluation and, sometimes, actual regulation."

Microwave News, Wired.com, CNN, and The Electronic Daily, have already reported upon this important study. Here is a transcript of CNN's August 15 report on the final evaluation. On October 6-8, 2002, further information on the final report was reported in prominent foreign newspapers including London's Sunday Times and Sunday Telegraph and Canada's Montreal Gazette, Windsor Star, and National Post. An October 17 article in the San Francisco Gate (the online arm of the San Francisco Chronicle) discusses the report's implication in length.

As a direct result of the California Report, parents in Edmonton, Canada, were able to temporarily delay construction on a new school that they feared was too near a transmission power line. However, ultimately, the school board decided to proceed.

During the week of March 31, 2002, the Minnesota Department of Health posted an evaluation of the massive report of the California Health Department that found that magnetic fields probably cause a number of deadly diseases. The evaluation, whose authorship is not stated, was produced in secret utilizing a process that was completely closed. Perhaps as a result, it contains numerous factual errors. Nothing is known about the people or process through which reached its conclusions, nor the standards it used. Additionally, in Minnesota, a so-called Interagency Working Group on EMF issues issued a report dated September 2002, but likely also published last week. It also contains numerous errors. Again, no authors were identified, and the process through which this report was produced was completely closed. Perhaps as a result, It is clearly not a serious report but rather a reiteration of the utility industry's position

A California Administration Law Judge recently agreed, concluding that power lines represent a health risk.

- ▶ The Japanese news service reports that new Japanese study finds that EMF is linked to children's brain cancer. This is part of a three-year research effort into the impact of EMF being conducted by the former Japanese Science and Technology Agency, now part of the education ministry. Nevertheless, the Minnesota Department of Health continues to cite this study as not finding such a link.
- ▶ 🇬🇧 A new UK study similarly finds a link between power line EMF and childhood leukemia. (Also reported by the BBC on October 30, 2004.) It is now asserted UK authorities suppressed this information for 3 years.
- ▶ 🇺🇸 New information developed for the Connecticut Siting Council demonstrates that is technically feasible to bury power lines for at least 20 miles.
- ▶ 🇺🇸 In an advertisement appearing on page A3 of the November 1 Wall Street Journal, the engineering firm ABB promotes its "no EMF technology, saying "Invisible Power Lines...From a revolutionary approach to underground power transmission....we're serving the world's energy needs while reducing impact on the environment. Delivering reliable, 'invisible' energy without any electromagnetic fields is just one of the ways we bring competitive advantage to customers...Welcome to the world of ABB."
- ▶ 🇬🇧 Richard Box from Bristol is the winner of the Bombay Sapphire Prize 2004 – the world's biggest award for artists, designers and architects working with glass. With a prize value of £20,000, this prestigious annual award that rewards and promotes excellence. "The piece drew attention to the presence of the electromagnetic field in a dramatic way, making the invisible, visible. For many who saw Field, it was a beautiful, magical and sinister experience, which was both thought provoking and educational."



- ▶ The UK's National Radiological Protection Board may reduce its limits for EMF exposures (October 20). New reports suggest that the NRPB will require homes to be at least 150 meters (about 450 feet) away from power lines (October 27).
- ▶ One of the issue confronting policymakers is the value of a human life. Does it make sense to spend \$4 million to bury a line if the reduction in EMF will save one life? An article in the on-line magazine *Slate* suggests a human life is worth between \$4 million and \$8 million.
- ▶ A three-fold increase in overall spontaneous abortions and a six-fold increase in spontaneous abortions occurring before the 10th week of pregnancy is associated with even momentary exposure to magnetic fields greater than 16 mG. This is the conclusion of new research by Dr. De-Kun Li reported in the January 2002 issue of *Epidemiology*. Similar results were found in a separate paper on spontaneous abortions prepared for the project by G. M. Lee which is printed in the same issue.
- ▶ A study reported in the October 11, 2003, edition of the UK *Sun* newspaper compared people living within 25 meters of a power line with others in the same area outside the 25-meter boundary. It found that more than one in seven pregnant women with homes near transmission power lines had miscarried, compared to one in 29 living further away. Of men and women living close to the lines, 27 per cent said they had suffered from depression compared to 13 per cent further away. Sixty-three per cent of those within 25 meters reported regular headaches compared to 39 per cent of those outside that distance. Insomnia and dietary problems were reported to be around 50 per cent higher near the power lines.
- ▶ According to a January 4, 2003, article in the *Toronto Star*, Canadian scientist Magda Havas has determined that 42 of 60 measured Canadian cities had magnetic field intensities that exceed those shown to be associated with childhood leukemia.
- ▶ According to a news report in *New Scientist* of January 10, 2002, Li's results caused a California Health Services department scientist, Raymond Neutra, to reexamine his 1991 study of 727 women. Originally, his group's study had measured average magnetic field exposures and with inconclusive results. However, when Neutra recently reanalyzed the data from his earlier study, he discovered the results were similar to Li's. Women exposed to peak magnetic field levels greater than 14 mg doubled their risk of miscarriage over those who had no such exposure.
- ▶ The results of nine major studies on EMF are reversed in a major analysis. Most of these studies originally had failed to find a link between electromagnetic fields (EMF) and cancer. The new review concludes that, upon reanalysis, the data used in the earlier studies do identify an association between cancer and EMF. The authors of the new analysis are the same researchers who headed the earlier studies that had failed to find an association. (See also the appraisal of this study in the industry journal, *Microwave News*.) The authors now conclude, "*The level of [statistical] significance that we see for the excess risk at high [EMF] exposure makes chance an unlikely explanation.*"
- ▶ A doubling of risk among children with average exposures above 4 mG is "unlikely to be due to chance," according to ICNIRP, a leading European quasi-governmental authority on the dangers of radiation. In a detailed review of the literature on ALS (Lou Gehrig's Disease), the ICNIRP believes that the data "point toward a possible risk increase."
- ▶ A dose-responsive relationship between magnetic fields from power lines and asthma and combined chronic illnesses is identified in an August 2001 Australian study. The study concludes, "The results are consistent with a possible adverse effect of environmental magnetic field exposure on immune-related and other illnesses."
- ▶ Dr. Paul Vailleneuve of the University of Ottawa finds in study published in February 2002 that those who were exposed to a moderate 6mG of magnetic fields increased by a factor of 12 their odds of developing an aggressive brain tumor know as glioblastoma multiforme.

- ▶ The Japanese National Institute for Environmental Studies and the National Cancer Center, in midterm analysis of a joint three-year survey project, have concluded children who are often exposed to such electromagnetic waves, emitted from high-voltage power lines and some household appliances, are on average more than twice as likely to get leukemia than those who are not exposed to EMF.
- ▶ A study conducted in the Netherlands shows that intermitted power frequency magnetic fields cause more DNA breaks than do steady fields. (August 2002)
- ▶ A new study, published in Cancer Cell International, presents experimental evidence to show that extremely low frequency electromagnetic fields can have a potentially damaging effect on the process of cell division in (already) radiation-injured cells, which could lead to them becoming cancerous. (August 2002)
- ▶ Research is being conducted in Brussels to determine the maximum exposure for ELF-EMF (September 2002)
- ▶ In a significant July 2002 study sponsored by, among others, the National Institute of Environmental Health and the Department of Energy, Reba Goodman and Martin Blank (who testified for the PLTF) note "It is now well established that low frequency (<300 Hz) electromagnetic (EM) fields induce biological changes that include effects ranging from increased enzyme reaction rates to increased transcript levels for specific genes... Despite cell and tissue differences (e.g., mammalian, dipteran, yeast, bacteria), approximately the same EM field exposure, 60 Hz, 80 mG for 20 min, (Goodman and Blank, 1998) induces hsp70 synthesis in all systems studied... DNA is known to conduct electrons, and studies on ATPase, cytochrome oxidase, and the BZ reaction, show that EM fields accelerate electron transfer rates. We have suggested that EM fields activate DNA by generating repulsive forces when accelerating electrons within the DNA double helix (Blank and Goodman, 1997, 1999, 2001)."
- ▶ The highly respected industry journal *Microwave News* concludes there is a scientific consensus people exposed to above-average levels of EMF experience "a clear and consistent pattern" of increased cancer risk "
- ▶ There is solid evidence that second hand smoke is less dangerous than magnetic fields.

Other Developments

- ▶ Question: Why, given all the above evidence, is there still a perception that power lines are not dangerous. Answer: Because rich corporations handsomely reward lobbyists and scientists for distorting the scientific evidence in order to advance corporations' economic interests, as discussed in this June 2005 article in the Scientific American.
- ▶ The State of Connecticut has enacted a law that effectively requires the burial of all large transmission power lines built near residences, schools, and other sensitive facilities.
- ▶ Another Minnesota community is impacted by a power line proposal.
- ▶ As reported by The San Francisco Examiner, on June 8, 2004, A California Administration law judge has expressed concern over EMF's. However the PUC's chairman indicates he will ignore the judge's recommendation.
- ▶ The UK's National Radiological Protection Board has lowered its maximum recommending exposure limits by adopting the Commission on Non-Ionizing Radiation Protection (ICNIRP)'s standards for maximum exposure to EMF from power lines. This standard sets the maximum exposure at 1000 mG, which is still a ridiculously high level, given the scientific consensus that there is a statistical link between EMF's greater than 4 mG and increases in the rate of cancer.
- ▶ According to a March 22, 2003 newspaper report, the EU plans to limit power line magnetic field emissions. (Switzerland already has limited them to 10 mG and Spain has declared such emissions to violate human rights.) It also reports that the world's

largest insurance body, Lloyds of London, is now refusing insurance coverage to power generating companies against damage to workers and consumers' health.

- A new technological development may defer for many years the need to build new transmission power lines. However, it also means that existing lines will become potentially much more dangerous than they are at present.

3M is supporting the advanced testing of its new Aluminum Conductor Composite Reinforced (ACCR) conductor. The new conductor uses a core of aluminum-matrix-composite wires surrounded by temperature-resistant aluminum-zirconium wires.

According to officials at the Department of Energy, the composite core is stronger than steel, but doesn't elongate as do conventional cores.

The new conductor, which has been under development for many years, carries up to 3 times as much current as conventional steel conductors of the same size.

Accordingly, it is likely most of the need for new transmission capacity can be met merely by replacing existing conductors with the ACCR conductor. Therefore, it will no longer be necessary to build new transmission lines, and it should now be possible to remove those existing lines that have undue environmental or human impacts. However, once existing lines are restrung with the new conductor, the magnetic fields they emit will become three times as intense.

Field tests are underway. The National Transmission Technology Research Center in Oak Ridge, TN, is testing the new conductor. Separately, the Tennessee Valley Authority has strung a test line near Oak Ridge. Using a \$4 million Congressional appropriation, the Western Area Power Administration has just begun a year-long test of a one mile, medium sized 795 kcmil conductor in a 230-kv installation near Fargo, N.D., under some of the most challenging weather conditions in the U.S.

As reported on June 13, 2004, in the Minneapolis Star Tribune, the energy utility Xcel plans to begin using this new wire. Elsewhere, construction of power lines using this technology is now underway.

- An article in the New York Times magazine of May 5, 2002, discusses "Evidence Based Medicine" (EBM). The application of EBM to ELFEMF would lead to far stronger actions than are currently entertained by public health authorities. The article suggests that resistance to EBM is lead by doctors who are unequipped to deal with rigorous science and who therefore feel threatened by this new trend in medicine. Another article in the August 10 New York Times points out that the causes for most cancers are not known. Given that the causes are unknown, it is unreasonable for the Minnesota Department of Health and others to decry the dangers of EMF on the grounds that it is not shown there is a cause and effect relationship between EMF and cancer.

- A recent article in the Lakeland Florida ledger relates how prospective homeowners fear transmission power lines.

Table of contents

Why be concerned about electromagnetic fields?

Dear Friend:

If you are concerned about power line or appliance radiation, you are not alone. Martin Halper, a director of the E.P.A., said in a Fortune Magazine article on magnetic radiation: "In all my years of looking at chemicals, I have never seen a set of epidemiological studies that remotely approached the weight of evidence that we're seeing with ELF electromagnetic fields. Clearly there is something here." (Fortune Magazine)

Over 64 studies in the U.S. and Europe have linked chronic exposure to magnetic fields, such as those from power lines and computer monitors, to cancer, leukemia, and tumors in humans. In the book "Currents of Death -- Power Lines, Computer Terminals, and the Attempt to Cover Up Their Threat to Your Health" (by Paul Brodeur, Simon and Schuster), electromagnetic fields are linked to headaches, chataracts, heart problems, stress, fatigue, nausea, insomnia, forgetfulness, chest pain, and significantly higher than expected rates of acute leukemia and acute myeloid leukemia. In animals, experiments have found higher birth defects and miscarriages.

There are now three studies linking computer use with higher rates of miscarriage and birth defects published in peer reviewed medical literature, such as in the American Journal of Epidemiology. There are also three major studies linking male breast cancer with power line fields.

Dr. David Carpenter, dean of public health at SUNY in Albany, N.Y., headed the utility industry's New York Power Lines Project, a five million dollar review of the carcinogenicity of magnetic fields. According to Dr. Carpenter, "The Savitz study changed my entire view of the field, and it has enormous implications." Fortune Magazine wrote: "Based of those results, he estimates that up to 30% of all childhood cancers may be attributable to ELF fields." "That's conservative," Dr. Carpenter added.

With so many common sources of ELF fields in our homes and work environment, you need to make sure you are not exposed to magnetic fields in a chronic fashion. The Office of Technology Assessment of the Congress of the United States recommends a policy of "prudent avoidance." Prudent avoidance means to measure fields and act to reduce exposure. To do that, one uses a Gauss meter. This easy to use device shows you which places in the home or office are safe from chronic exposure to magnetic radiation, and which places are not.

In addition to long-term health concerns, buying a house or living in a house with high fields will be an economic disaster. In a few years, when power line radiation is as well known as asbestos and radon, a house near power lines or with high fields will be practically impossible to sell. Business Week writes that there are over 100 lawsuits regarding power lines and property devaluation.

If you are concerned about computer radiation, we urge you to use our computer monitors. As the literature mentions, they come with a certificate showing the extremely low levels. Be safe! Call us today at 1-800-222-3003.

The Technology Alternatives Corporation Staff.

The Latest News:

Excerpts from: **MICROWAVE NEWS -- A Report on Non-Ionizing Radiation**

August 2002

California EMF Program to issue Strongest Health Warning Yet

After spending more than \$7 million over the last eight years, the California Department of Health Services (DHS) will soon issue the strongest warning to date on the potential health risks from exposure to power-frequency electromagnetic fields (EMFs).

Drs. Raymond Neutra, Vincent DelPizzo and Geraldine Lee, who wrote the report, conclude that they "are inclined to believe" that EMFs are a cause of childhood leukemia, adult brain cancer, amyotrophic lateral sclerosis (ALS) and miscarriages.

The final report of the EMF Program, which runs more than 500 pages including appendices, has not yet been released, but *Microwave News* has obtained a copy. It "is slowly working its way through the bureaucracy," said Neutra of the DHS, who led the program. He expects to submit it to the California Public Utilities Commission (PUC) "at the end of the summer."

"We lowered a few of the risk estimates, but overall the conclusions in the final report are very similar to those in the draft," said DelPizzo, who served as research director of the EMF program before retiring recently to Reno, NV.

July/August 2001

ELF EMFs (electromagnetic fields) are now classified in the same category as DDT, lead, Carbon Tetrachloride and Chloroform, Category 2B possible carcinogens.

IARC Finds ELF EMFs Are Possible Human Carcinogens

A working group assembled by the International Agency for Research on Cancer (IARC) has unanimously concluded that power-frequency magnetic fields are possible human carcinogens. This finding, announced on June 27 in Lyon, France, is based on the consistent association between childhood leukemia and residential exposure to extremely-low-frequency electromagnetic fields (ELF EMFs).

The makeup of the IARC panel spanned all sides of the EMF controversy, from those who openly believe that EMFs promote cancer to industry consultants who are skeptical of any such connection. "We all agreed," said Dr. Larry Anderson. EMFs have now been formally designated "2B Possible Carcinogens." (For a list of the members of the working group and their affiliations, and examples of each type of IARC

carcinogens, see below.

"There was a unanimous feeling about it," said Dr. Jan Stolwijk. Dr. Maria

Stuchly, who remains unconvinced that magnetic fields are responsible for promoting leukemia in children, nevertheless joined the others in voting for the 2B designation. "The epidemiological data are there and it is hard to dismiss them," she said. Dr. Vincent DePizzo believes that the cancer evidence is stronger than do any of the other panelists. He cast the only vote that there is "sufficient" human evidence for childhood leukemia, which implies that EMFs are known human carcinogens. "I am sure that the childhood leukemia finding cannot be attributed to chance, bias or confounding," he said. (See table below for definitions of "sufficient," "limited" and "inadequate")

The IARC decision follows similar reviews by panels in the U.S. and the U.K. In 1998, a working group of the National Institute of Environmental Health Sciences (NIEHS), using the same IARC criteria, also classified EMFs as 2B possible human carcinogens, a view that NIEHS Director Kenneth Olden later endorsed in his report to Congress. Earlier this year, an advisory committee to the UK National Radiological Protection Board chaired by Sir Richard Doll, also acknowledged the possible link between EMFs and cancer.

The childhood leukemia studies have had a major impact on all of these prior assessments. The Doll report was heavily influenced by the two recent pooled analyses: one led by Dr. Anders Ahlbom and the other by Dr. Sander Greenland. The IARC panel was similarly swayed, according to both Stolwijk and Dr. Elizabeth Hatch. "The Ahlbom analysis was found to be most impressive," noted Stolwijk. Much more surprising was the IARC panel members' view of the animal data. They came close to finding "limited" support for a cancer association based on the animal exposure experiments.

IARC Carcinogens: Definitions and Examples:

Category 1: Carcinogen

Evidence: Sufficient in humans

Chemical and physical agents:

Asbestos, benzene, dioxin, hepatitis C virus, radon, vinyl chloride. Total number of agents: 87.

Category 2A: Probable Carcinogen

Evidence: limited in humans and sufficient in animals

Chemical and physical agents:

Benzo[a]pyrene, formaldehyde, PCBs, ultraviolet (A,B&C) radiation. Total number of agents: 63.

Category 2B: Possible Carcinogen

Evidence: limited in humans and less than sufficient in animals

Chemical and physical agents:

Carbon tetrachloride, chloroform, coffee, DDT, ELF EMFs, lead, PBBs. Total number of agents: 236

June, 2001

Maximum EMF Exposure Emerges

As Strong Miscarriage Risk

A new and innovative epidemiological study has found an up to six fold

increased risk of spontaneous abortions among women exposed to magnetic fields of 16 mG or greater. The results “should have wide implications,” concludes Dr. DeKun Li, who led the study team at Kaiser Permanente’s research division in Oakland, CA.

Unlike past efforts, which have essentially all used average fields, Li focused on *maximum* magnetic field (MMF) as the key index of exposure. While Li found miscarriage risks that are significantly higher for women who had an MMF of at least 16 mG, he saw no excess for women with time weighted averages (TWA) of 3mG or more. Nor did he observe any increased risk for elevated spot electromagnetic field (EMF) measurements or with wire codes. “With TWAs you are diluting any possible effect because you are combining relevant and irrelevant exposures,” Li told *Microwave News*. In a paper summarizing his results, Li argued that, “It seemed more plausible to us that MF exposure has a threshold below which any exposure is biologically irrelevant.” Li’s paper is an appendix to the as yet unreleased final report of the California EMF Project (see p.2). An advance copy of Li’s paper was obtained by *Microwave News*.

“My study convinced me that EMFs probably have a biological effect,” Li said. “We are entering a new chapter in the field of EMF epidemiology. There is more evidence that there is an association—the better conducted studies consistently show an association.

A “Robust” Association

“This population based cohort study with prospectively measured

MF exposure level revealed for the first time (based on our search of Medline) an increased SAB risk associated with a MMF exposure level of 16mG. The adverse MMF effect appeared to have a threshold around 16 mG and persisted regardless of the sources/locations of MMF exposure. Prenatal MMF exposure had a greater effect on early spontaneous abortion (< 10 weeks of gestation) when embryos or fetuses are much more sensitive to environmental insults, and among women who may be more susceptible to environmental exposures.

The association was much stronger when women whose 24 hour MF measurements may not reflect their true prenatal MF exposure were excluded. These biologically coherent observations, all based on a priori hypotheses, provide strong evidence that prenatal MF exposure above a certain level (possibly around 16 mG) may increase SAB risk. It is also unlikely that the observed association was due to biases or unmeasured confounders, because any such biases or confounders would have to explain the above observations simultaneously. The robustness of the association against potential confounders was further supported by the evidence that, despite adjusting for more than 30 variables of known or suspected risk factors for SAB, the estimates were barely altered. Moreover, prompted by the findings in this study, Lee et al. reanalyzed the data from the study in which the findings related to TWA exposure led to funding the current study, and confirmed our observed association between MMF and SAB risk. These findings raise the question of the effect of MMF

on reproductive outcomes and other health endpoints. The MMF exposure level in our study population was quite comparable to that found in a nationwide survey and our study population was racially/ethnically and socioeconomically diverse. Thus, the findings from our study should have wide implications.”

DeKun Li, “A Population Based Prospective Study of Personal Exposure to Magnetic Fields During Pregnancy and the Risk of Spontaneous Abortion,” unpublished manuscript, May 2001.

G.M. Lee et al., “A Nested Case Control Study of Residential and Personal Magnetic Field Measures and Spontaneous Abortions,” *Epidemiology*, submitted.

Li stressed that 16 mG is not a rare exposure. He noted that approximately 75% of his study population had at least one exposure above this threshold in a 24-hour period. Li said that such peak fields are more likely to come from household electrical appliances and transportation sources than from local electrical distribution lines.

The Kaiser Permanente study has cleared peer review and is scheduled to be published in the November issue of *Epidemiology*, Li said. His results were first disclosed at a meeting convened by the California EMF Program on April 25. Kaiser Permanente is the largest and oldest health care provider in the U.S.

“It’s quite exciting if it holds up,” Dr. Nancy Wertheimer said

in an interview. “ More work needs to be done on thresholds and short term high exposures.” Wertheimer, who lives in Boulder, CO, was a member of Kaiser’s internal peer review team. Wertheimer and Ed Leeper have themselves reported associations between miscarriages and EMF exposures from electrically heated beds and home electrical heating systems.

Others have also seen a miscarriage risk due to magnetic fields from video display terminals (see *MWN*, M/J88 and M/A92) and from power lines (see *MWN*, M/A92).

“Taken together the EMF studies of spontaneous abortions paint a consistent picture,” said one epidemiologist, who has read the new Li paper but who asked not to be identified.

The new study is the first prospective study ever done for EMF health risks and the first to use maximum magnetic field exposures to gauge risks. A total of 969 women who had been pregnant for less than ten weeks qualified for the study, and the outcomes of their pregnancies were monitored. They wore an EMDEX meter for 24 hours and were then asked if their activities during that particular day were “typical” of the pregnancy.

“One of the strengths of this study was that we measured MF exposure during the relevant period and used personal measurement to capture MF exposure from all sources encountered by a woman,” Li wrote.

Li found that women who were exposed to MMFs of 16 mG

or more had 80% more miscarriages compared to those exposed to less than 16 mG—a statistically significant increase. But when women who said that they had worn the EMDEX on an atypical day are eliminated from the study population, the miscarriage risk increases to three times that of the less exposed women.

And for pregnancies lost during the first ten weeks of gestation, the risk is close to six times that of the less exposed women. All these results are also significant.

Of the 159 women who had spontaneous abortions, 132 had exposures above 16 mG, and of these 95 said that they had taken measurements on a typical day.

For women who were judged to be more susceptible to environmental insults—those who had already had two or more miscarriages or who had fertility problems—the miscarriage risk is three times higher when they were exposed to 16 mG or more.

This risk rises to close to five times that of the unexposed women for those pregnancies that were lost before the tenth week of gestation, a time when the fetus is most sensitive to environmental insults. Both these risks are statistically significant.

“All this evidence points to an underlying biological effect of the magnetic field rather than bias or a chance finding,” Li said. “If this were a chance finding, you would not expect there to be a difference between typical and atypical exposures and between early and late abortions.”

In the interview, Li said that he was “a little disappointed” by the recent commentary on EMF epidemiology by Dr. David Savitz. A number of researchers have argued for the need to look beyond TWAs to measure biologically relevant EMF exposures. For instance, in the early 1990s, Drs. Richard Lovely and Bary Wilson of the Battelle Labs in Richland, WA, pointed specifically to MMF exposure as an alternative exposure index (see *MWN*, *M/J93*). Until Li, no one had followed up their suggestion. In a previous epidemiological study, Li found that women with fertility problems who used electric blankets during pregnancy had a greater chance of having babies with birth defects (see *MWN*, *S/O95*). The risk was ten times higher among women who used electric blankets during the first trimester.

September 2001

WHO EMF Project Now Endorses Policy of Prudent Avoidance

In a major policy shift, the World Health Organization’s (WHO) International EMF Project has endorsed prudent avoidance.

On October 3, the WHO advised that decisions on siting power lines should “consider ways to reduce people’s exposures.” The WHO also recommended that governments and industry should offer the public “suggestions for safe and low-cost ways to reduce exposures.” The advice is contained in a fact sheet

on extremely low frequency electromagnetic fields (ELF EMFs) and cancer.

The project's new outlook follows the decision by an expert panel convened by the International Agency for Research on Cancer (IARC) to classify ELF EMFs as "possible human carcinogens" (see *MWN*, J/A01). IARC, which is based in Lyon, France, is part of the WHO.

Three years ago, in its last fact sheet on ELF EMFs and cancer, the WHO project took a very different view. "There is no need for any specific protective measures for members of the general public," it stated—beyond meeting the exposure limits recommended by the International Commission on NonIonizing Radiation Protection (ICNIRP). This standard protects against acute health hazards, such as shocks and burns, but does not address cancer risks.

At that time, Dr. Michael Repacholi, who oversees WHO's work on EMFs, told *Microwave News*: "It is not WHO's job to be recommending 'prudent avoidance' to national governments" (see *MWN*, N/D98).

As late as last year, the EMF project advised that prudent avoidance "may be justified," but warned that "such actions should not be recommended by national authorities on health grounds." Rather, they may be appropriate to deal with individual perceptions of risks (see *MWN*, M/J00).

"The precautionary principle cannot be applied to EMFs."

—Dr. Paolo Vecchia

*“The lower the limits, the
greater the public concern.”*

—Dr. Michael Repacholi

German Radiation Commission Endorses Prudent Avoidance

Germany’s Radiation Protection Commission is recommending a policy of prudent avoidance.

In a report released on September 14, the panel—known by its German acronym SSK—states that it has confidence in the ICNIRP standards. But it calls for “minimizing” exposures to both ELF and RF/MW EMFs to the extent “technically and economically reasonable,” especially in locations where people spend extended periods of time.

The SSK recommends that emissions from consumer appliances, including mobile phones, be kept as low as possible and that product labels indicate emission levels.

The SSK also argues for more health effects research.

The Federal Environment Ministry, which is revising

Germany's EMF safety rules, requested the report (see *MWN*, S/O97). In July, the ministry announced that it was weighing precautionary exposure limits for mobile phone base stations, but would wait for SSK's advice (see *MWN*, J/A01).

The SSK's principal expert on non ionizing radiation is Dr. Jürgen Bernhardt, who is the vice chair—and a past chair—of ICNIRP and a former head of Germany's Radiation Protection Office.

On July 31, the radiation office's current director, Wolfram König, advised against the use of mobile phones by children and called for restrictions on base station antennas near schools and hospitals (see *MWN*, J/A01).

The full text of the SSK's 56page report, *Limits and Precautionary Measures to Protect the Public Against Electromagnetic Fields*, is available in German at <www.ssk.de>.

JUNE 2000

Strong Electric Fields Implicated in Major Leukemia Risk for Workers

Long term employees of Ontario Hydro who worked in strong electric fields had much higher risks of leukemia, Canadian researchers have found.

Significant risks were also found for non Hodgkin's lymphoma (NHL) in a related study.

The elevated risks were seen among workers who spent the most time in electric fields above certain thresholds, in the range of 10 to 40 V/m. The largest increases occurred among those with more than 20 years on the job. Senior workers with the greatest time above the thresholds had an eight to tenfold increase in the risk of leukemia —much higher than in past epidemiological studies of electromagnetic fields (EMFs).

“It's very interesting that there seems to be a threshold effect,” Dr. Anthony Miller, a coauthor of the study, told *Microwave News*. “ These studies confirm that electric fields are very important, if not dominant,” Miller said. “I think that's a very important message.” Both studies were based on data from Miller's 1996 study of Ontario Hydro employees, which put a spotlight on cancer risks and electric fields (see *MWN*, J/A 96). Formerly at the University of Toronto, Miller is now with the German Cancer Research Center in Heidelberg.

Paul Villeneuve of the University of Ottawa, who led the studies as part of his doctoral dissertation, said, “It's remarkable that we saw similar threshold effects for both leukemia and NHL.”

The threshold levels were “relatively consistent” in the two studies, he noted.

In an interview, Dr. Lois Green of Ontario Power Generation (formerly part of Ontario Hydro) in Toronto described this work

as the first of its kind. “No one has ever taken a systematic look at threshold effects before,” she said. Most previous studies have focused on cumulative effects or time weighted averages, which Green called “a very limited way to view EMF exposures.” The new work by Villeneuve, Miller and colleagues “shows that there are other important ways of looking at exposure,” she said. “We can’t close the door on this question.”

The new Canadian results stand in sharp contrast with past EMF epidemiological studies, most of which have focused almost exclusively on magnetic fields. Dr. David Savitz of the University of North Carolina, Chapel Hill, told *Microwave News* that the new findings “suggest that those doing future studies reconsider the pessimism about the value of electric field data.” “Our results suggest that there is no association between exposure to magnetic fields and NHL,” Villeneuve and colleagues write in the April issue of *Occupational and Environmental Medicine*, and no threshold effects were seen with magnetic fields in either study. In the leukemia study, some nonsignificant elevations in risk were observed for workers with higher average magnetic field exposure.

Miller’s 1996 study also described electric fields as the main source of risk, but indicated that the highest risks came from combined electric and magnetic exposure. While the two new studies “tend to confirm the dominance of electric fields,” he said, “I’m not sure they remove any effect for magnetic fields.”

For electric fields, however, Miller now believes that the threshold analysis in the new papers is a more precise way of measuring their impact.

The leukemia study, published in the June issue of the *American Journal of Industrial Medicine*, found that the amount of time spent above these thresholds was a “significant predictor of leukemia risk.” While average exposure was also linked to an increase in risk, Villeneuve and colleagues write, their results indicate “that leukemia risk is more sensitive to exposures above a threshold.”

For workers employed for more than 20 years, the findings were especially striking. Of these, the one third who spent the most time above 10 V/m were ten times more likely than others to develop leukemia, a significant increase. The one third with the most time above 20 V/m had a risk eight times higher than others. These odds ratios, however, had very wide confidence intervals.

The case control study was based on 50 cases of leukemia and 200 controls, drawn from a cohort of over 31,000 male Ontario Hydro employees and retirees. Employment data were linked to a job exposure matrix based on both job title and work site, with personal measurements from over 800 workers, and to incidence data from the Ontario Cancer Registry. These data were the basis of Miller’s 1996 study, which was part of a three utility study

that included workers at Hydro Quebec (HQ) and Electricité de France (EDF) (see *MWN*, M/A94). The Ontario research used a more detailed exposure assessment—taking into account job location as well as title—than was used for the other utilities. The NHL study was based on 51 cases and 203 controls from the same study population. It found that the one third of workers who spent the most time in electric fields above 10 V/m had triple the risk of NHL. Those with the most time above 40 V/m were 3.6 times more likely to get the disease.

“Many of us, starting with Genevieve Matanoski around 1986, have long held that we need to look at alternative indices of exposure,” Dr. Indira Nair of Carnegie Mellon University in Pittsburgh told *Microwave News*. Confirmation of this point is “the central importance of these papers,” said Nair. “Until we are able to elucidate a mechanism, studies that include these alternate indices can provide us with understanding which may help us eventually to ‘back into’ the mechanisms.”

A 1997 paper in *Bioelectromagnetics* by Nair and Dr. Jack Sahl, then of Southern California Edison and now a consultant based in Upland, CA, examined how using different indices of exposure influenced the exposure assessment of different job categories. While average field strength could be used for separating jobs into “high” or “low” exposure, they concluded, it “may be misleading” in ranking jobs which have significant exposure. For example, electricians were highest in average exposure,

while substation operators were highest in time spent above certain magnetic field thresholds.

“We still don’t know what is the biologically relevant exposure,” commented Green. “Some of these exposures are very complex, and some of the effects are very subtle.” While Villeneuve’s studies are “very interesting and important,” she said, they are certainly not the last word. She pointed out that while significant risks were observed, the numbers of cases are small and as a result the risk estimates are “unstable.”

Miller noted that these latest findings cannot be directly extrapolated to work on childhood leukemia. “These studies involve occupational exposures, which of course are much higher than in a residential environment.” Also, he noted, childhood leukemia is “a different disease from adult leukemia—it’s a different histological type.” Miller said that in a 1999 study of childhood leukemia in Toronto, which was led by Green, “We could find no effect at all of electric fields.” When its findings were published, Green’s team concluded that, “As exposure assessment is refined, the possible role of magnetic fields in the etiology of childhood leukemia becomes more evident” (see *MWN*, J/A99).

Villeneuve pointed to computer modeling work by Dr. Maria Stuchly and colleagues at Canada’s University of Victoria, estimating the level of induced current in different organs of the body that might result from each type of exposure. Among other findings,

they calculated that electric fields would be likely to produce especially high peak levels of induced current in the blood, while magnetic field exposure would produce higher currents in the brain and cerebrospinal fluid.

Villeneuve and colleagues conclude their leukemia paper by recommending that “similar analyses be pursued in other study populations.” But it appears that few if any existing data sets would be suitable. Villeneuve said that the only studies he knew of that had the right electric field measurements were the EDF and HQ components of the triutility study. He noted, however, that the French researchers had not followed up with workers after retirement age and that the HQ data had fewer cases, both of which “would limit analyses.”

“It’s unfortunate that people haven’t collected the data on electric field exposure,” said Dr. David Agnew of Ontario Power Generation in Whitby, Ontario—a coauthor of the Villeneuve papers and of Miller’s 1996 study. Agnew told *Microwave News* that any repetition of the Villeneuve studies would probably require completely new research.

“I somehow can’t see this happening,” commented Green, “which is a great disappointment.” She noted that “funding is not coming forward to support follow-up studies in this area”—no matter how compelling the results. In the long run, though, Green thinks the issue will demand attention. Even if it is buried,

she said, "I'm not sure it will stay adequately buried."

Paul Villeneuve, David Agnew, Anthony Miller, Paul Corey and James Purdham, "Leukemia in Electric Utility Workers: The Evaluation of Alternative Indices of Exposure to 60 Hz Electric and Magnetic Fields," *American Journal of Industrial Medicine*, 37, pp.607617, June 2000.

Paul Villeneuve et al., "NonHodgkin's Lymphoma Among Electric Utility Workers in Ontario: The Evaluation of Alternative Indices of Exposure to 60 Hz Electric and Magnetic Fields," *Occupational and Environmental Medicine*, 57, pp.249257, April 2000.

Jun Zhang, Indira Nair and Jack Sahl, "Effects Function Analysis of ELF Magnetic Field Exposure in the Electric Utility Work Environment," *Bioelectromagnetics*, 18, pp.365375, 1997.

Trevor Dawson, Kris Caputa and Maria Stuchly, "A Comparison of 60 Hz Uniform Magnetic and Electric Induction in the Human Body," *Physics in Medicine and Biology*, 42, pp.23192329, December 1997.

U.K. Panel Discourages Use of Mobile Phones by Children

A high level panel appointed by the U.K. government has recommended that children be discouraged from using mobile phones and that the industry not market phones to children. Although the Independent Expert Group on Mobile Phones, chaired by Sir William Stewart, found that there was no evidence of a health risk, it favored a "precautionary approach" given current "gaps in knowledge."

"I have got a grandchild of four and a grandchild of two and I would not be recommending that they have mobile phones," Stewart told the BBC, noting that he would continue to use his own phone. Stewart was science advisor to the prime minister from 1990 to 1995.

The 12 members of the expert group issued their report on May 11. They asked that radiation exposure data for different phones—specific absorption rates (SARs)—be "readily accessible to consumers" and that there be no shortcuts in the planning process for the siting of mobile phone base stations.

Electromagnetic radiation in the news!

Concerning power lines and appliances:

□ *USA Today* conducted a survey of 4,567 readers and reported that electromagnetic fields, or EMF's, are the number one environmental concern in America. "EMF's - always present near power lines and working electrical appliances - are linked to such diseases as leukemia and breast cancer."

□ "The National Council on Radiation Protection and Measurements (NCRP) committee charged with evaluating the potential health effects of electromagnetic fields (EMFs) has completed a draft report that calls for strong action to curtail the exposure of the U.S. population. "It took us nine years but we finally reached agreement," committee chair **Dr. Ross Adey**, of the Veterans Administration Hospital in Loma Linda, CA, told *Microwave News*.

□ A draft report prepared for the Environmental Protection Agency (EPA) generally endorses a 2 mG exposure limit. It would take effect immediately for new day care centers, schools and playgrounds, as well as for new transmission lines near existing housing. The report was funded by the EPA. Dr. Joe Elder, EPA's program officer for the NCRP study in Research Triangle Park, NC, called the committee's report "the first comprehensive review of the world's literature on EMF health effects."

Microwave News, July/August, 1995

□ "I have never seen a set of epidemiological studies that remotely approached the weight of evidence that we're seeing with ELF [extremely low frequency] electromagnetic fields. Clearly there is something here."

Martin Halper, EPA Director of Analysis and Support.

□ "Electromagnetic fields are associated with the development of leukemia, brain cancer and other serious diseases."

Paul Brodeur, writer, *The New Yorker Magazine*, author of *Currents of Death* (Simon and Schuster), and *The Great Power Line Coverup* (Little, Brown).

□ "...studies on cats, rats, and chick brain cells have shown that low frequency electromagnetic radiation interacts with brain activity and could cause a host of negative symptoms from heightened stress and depression, slowed reaction time, and learning disabilities to miscarriages, fetal deformities, and cancer."

Business Week, Oct. 30, 1989.

□ "This is really harming people."

Dr. David Carpenter, Dean, School of Public Health, State University of New York, Albany.

□ When buying a home, it is important to check for EMF's. Homes "sold...for 30% less" when exposed to EMF's, as reported by the *Wall Street Journal*, September 8, 1993.

□ According to a survey conducted by *Indoor Air Review*, 26% of homes have areas that register EMF fields exceeding 3 milligauss.

□ "...Sweden has concluded that EMF's do lead to higher rates of cancer...I, frankly was somewhat impressed by the arguments made by the Swedes." - **President Bill Clinton**

Concerning televisions and computer displays (VDTs):

□ "Most unsettling of all, perhaps, is the fact that the pulsed VLF and ELF magnetic fields found routinely within a radius of about two feet from the average CRT computer terminal can be as strong as, or even stronger than, the sixty-hertz magnetic fields found inside the homes in which Wertheimer and Savitz discovered children to be dying unduly of cancer."

The New Yorker, June, 1989.

□ "...sit at least ten feet away from the television set."

Time Magazine, July 17, 1989.

□ A Swedish study has found that weak, pulsed magnetic fields similar to those emitted by VDTs can cause fetal abnormalities in the offspring of pregnant mice. According to Tom Brokaw of NBC News, "the findings no longer rule out the possibility that radiation can affect human fetuses." In Sweden, a major Swedish union (the Swedish Confederation of Professional Employees, or TCO) is seeking more stringent limits, and pressure is being put on the Swedish government to change VDT work regulations to protect pregnant women.

□ A study released in February, 1991, by the University of Southern California (UCS) in Los Angeles has found an increased rate of leukemia among children who watch black and white televisions.

Power Line Health Facts

...information for the concerned

Home

EMF

ELF-Magnetic

Meters

Search

Contact Us

FAQ



Summary

Here are answers to the most frequently asked questions about EMF. The evidence supporting these answers are found elsewhere on this web.

FAQ for Health Effects of Transmission Power Line Magnetic and Electric Fields

This FAQ is designed to answer in a brief and readily accessible format questions frequently asked about the dangers associated with exposure to magnetic and electric fields emitted by transmission power lines.

The questions contained herein confined only to issues associated with the extremely low frequency electro magnetic fields (ELF-EMF) associated with transmission power lines. Similar issues have been raised concerning the high frequency magnetic fields associated with cell phones. These high frequency fields have impacts that differ from those associated with power lines and, therefore, this FAQ does not apply to them.

1. *What are transmission power lines?*
 - a. They are those high voltage lines that carry power from power plants to substations or between substations. Generally, they carry voltage greater than 35 to 65 kV (kilovolts). Lines that carry power from substations to the ultimate users are called distribution lines. They generally use voltages under 35 kV. Transmission power lines radiate magnetic and electric fields that pulse sixty times per second. This is called extra-low frequency EMF (ELF-EMF).
2. *How can I determine if a line is a transmission or distribution line?*
 - a. One rule of thumb is to count the number of mushroom shaped insulators between the line and the structure that holds the line. If there are more than three such insulators, it is likely to be a transmission line. If there are around 7-12 insulators, the line probably carries 115 kV. Twelve or more suggests the line carries more than 300 kV.
3. *I feel nothing unusual when I am near a transmission power line. Why might they be dangerous?*
 - a. Transmission power lines emit two types of fields, electric and magnetic. Together they are called electro-magnetic fields, EMF. Magnetic fields are known to interact with animal tissues, and are therefore potentially dangerous. While a tiny minority can sense magnetic fields, most of us can detect neither magnetic nor electric fields.
4. *Are magnetic fields from power lines dangerous to human health?*
 - a. There is substantial evidence that exposure to extra-low frequency magnetic fields of an average intensity greater than 2 milligauss doubles the risk of a child contracting leukemia. There is very good evidence that even momentary exposure to ELF fields greater than 16 mG increase by a factor of 5 a woman will have a spontaneous abortion within the first 10 weeks of pregnancy. There is also evidence that these fields are associated with other diseases (see below). Exposures below 2 mG appear to have no adverse health effects. High frequency magnetic fields emitted by cell phones and TV station antennas are a different phenomena.

5. *How common is magnetic field exposures at the dangerous levels.*
 - a. Not very common. Less than 2% of the population experiences ELF magnetic fields that average more than 2 milligauss. Average US exposure is around 0.5-0.75 mG. The number of those who experience momentary exposures greater than 16 mG is not known.
6. *Are electric fields from power lines dangerous to human health?*
 - a. There is little evidence that electric fields at the intensities associated with power lines directly impact human health. However, these fields have the potential for indirectly inducing harmful reactions. It is undisputed that fields above 1 mV/m (millivolt per meter) can disrupt heart pacemakers and defibrillators. Electric fields of this intensity, while rare in general, are common immediately adjacent to transmission power lines. Also, one researcher claims that electric fields from power lines ionize particles in the air, and these particles are carcinogenic. This research has been validated by epidemiological evidence.
7. *I live near a transmission power line. How do I know if I am in danger?*
 - a. When assessing danger, distance is all-important. The current research seems to suggest that living further than 400 feet from a transmission line will provide an adequate margin of safety from magnetic fields. However, the very latest research suggests that pregnant women should *never* venture anywhere near a transmission power line, for even momentary exposure to high magnetic fields sharply enhances the risk of a miscarriage. They should avoid even driving under a transmission power line.
 - b. Those utilizing pace makers or automatic defibrillators should similarly avoid even momentarily venturing near transmission power lines.
 - c. Those concerned about the less-documented risks associated with particles ionized by electric fields should avoid outdoor exposures with 2000 feet downwind from transmission power lines.
8. *Are lower voltage power lines (say 115 kV) safer than high voltage (345kV and above) lines?*
 - a. The risks associated with electric fields directly correspond to a line's voltage. Therefore, the risks associated with electric fields increase in tandem with the line's voltage.
 - b. The better documented risks associated with a line's magnetic field are associated with the current going through a line rather than its voltage. To deliver a given amount of power, utilities must push more current thorough low voltage lines than high voltage lines. Therefore, in-field measurements show the magnetic field under a 115 kV line is often greater than the field immediately under a 345 kV line. Also, high voltage lines are customarily built on wider rights of way than low voltage lines. Therefore, people tend to live closer to low voltage lines than they do to high voltage lines. For these reasons, low voltage transmission power lines generally pose a greater risk to human health than do high voltage lines. Lines with 65 kV or less usually emit very low levels of magnetic fields.
9. *Can magnetic fields be reduced by physical barriers?*
 - a. Not usually. Walls, houses, trees and the like are no impediment to magnetic fields. Field measurements indicate occupants of the front seats of cars experience an approximate 30% reduction in magnetic fields.
10. *Can electric fields be reduced by physical barriers?*

- a. Yes they can. Furthermore, particles ionized by electric fields pose a danger only to those, like children, who are outside a good part of the day.

11. How strong is the evidence identifying an associated between ELF magnetic fields and human disease?

- a. There is extremely strong evidence finding a relationship between ELF magnetic fields greater than 2 mG and childhood leukemia. This relationship has been a matter of scientific inquiry since 1979. Sixteen out of nineteen studies conducted since 1995 are now viewed as identifying a statistically significant relationship between magnetic fields greater than 2 to 4 mG and a two to four-fold increase in a child's risk of contracting that disease.
- b. There is very strong evidence finding a relationship between maximum ELF magnetic field exposure greater than 16 mG and a 6-fold increase in miscarriages.
- c. There is strong evidence linking ELF magnetic fields and Alzheimer's and Lou Gehrig's disease (ALS).
- d. There is substantial evidence linking ELF magnetic fields greater than 12 mG and breast cancer and strong evidence linking magnetic fields and the suppression of the therapeutic effects of the anti-cancer drug, tamoxifen.

12. How strong is the evidence linking electric fields and cancer?

- a. There is only one source of studies linking ELF electric fields to the creation of cancer causing particles through ionization. However, a mechanistic process has been identified. It has been verified by in-field measurements, and validated through epidemiological studies.

13. Why have there not been follow up studies on the link between electric fields and cancer?

- a. There is no constituency to promote the funding such studies. This is a big problem in this field ([see below](#)).

14. Why is there not more intensive research in the US on the link between ELF-EMF and cancer?

- a. Only a small percentage of the population lives near enough to transmission power lines to be exposed to the dangerous magnetic fields of intensities greater than 2 mG. A far greater percentage may be exposed to dangerous fields from the lower voltage distribution lines, but, as far as we know, there has been no studies on the incidence of magnetic field exposures from distribution power lines. Furthermore, the utility industry aggressively acts to minimize such dangers through the issuance of exculpatory statements and its funding of research that downplays the dangers ([See EPRI discussion below](#)).

15. There are those who suggest non-ionizing radiation such as ELF-EMF contains too little energy influence animal tissues.

- a. This formerly popular argument has largely fallen into disuse. Ionizing radiation (such as X-rays) contains sufficient energy to knock electrons out of their valiances, thereby creating chemically active ions. By-in-large, ELF-EMF does not contain sufficient energy to create ions. It was therefore argued ELF-EMF must be biologically inactive. The argument has largely fallen into disuse (except by John Muller-see the next question) because all knowledgeable scientists agree that magnetic fields have biological impacts. They clearly promote bone growth at high intensities, suppress melatonin production, and induce cells to emit stress proteins. The argument revolves around whether these recognized biological impacts imply potential human harm. (The electric fields immediately adjacent to power lines are ionizing,

which is the genesis of the argument that electric fields are associated with cancer.)

16. *Who are John Moulder and Peter Valberg, and why are they so vociferous in decrying the dangers of EMF?*

- a. John Moulder and Peter Valberg both earn substantial incomes from testifying for power companies that ELF-EMF is not dangerous. John Moulder is the most active, having been under retainer from five utilities simultaneously. Valberg is associated with Harvard University (although not a full-time faculty member). He has not done work in the field for at least five years.

17. *Moulder and Valberg seem to be able to cite significant evidence that suggests there is no danger. How can that be?*

- a. In September of 2000, there was an extraordinary event, the publication of the British Journal article. In that article, the prime authors of all the significant epidemiological research of the past five years came together and admitted their original research has come to invalid conclusions. Whereas they had originally concluded there was not a statistically significant relationship between ELF-EMF and cancer, they now conceded that their original research should have recognized the existence of such a significant relationship. These results were confirmed by two additional research groups. Moulder and Valberg, while aware of the new research, justify their assertions by pointing both to invalidated research and to "blue panels" that, relying upon the now-invalidated research, had found insufficient evidence for such a relationship. In addition, Moulder frequently distorts the findings of his references by pejoratively picking sentences out of context.

18. *While Moulder and Valberg are biased by their personal financial considerations, are you not equally biased by your personal concern over EMF's deleterious impact?*

- a. Yes.

19. *Bodies such as the UK National Radiological Board and the comparable German authorities, while finding a link between ELF-EMF and cancer, have said it's not worth worrying over. How can that be?*

- a. Europe employs on average higher voltages than does the US. Because of the physics, this means that European transmission power lines emit lower levels of magnetic fields than do US lines. Furthermore, most European countries, including the UK and Germany have prohibited the construction of transmission power lines near homes for many years. The US has no comparable restriction. As a result, only a negligible number of European homes experience high levels of ELF-EMF. However, such high-level exposures are common in the US. Accordingly, European conclusions on the low level of exposures do not apply to the US.

20. *The IARC, a division of the World Health Organization has found a link between cancer and ELF-EMF. Yet, it seems extraordinarily cautious in its pronouncement of this link. Similarly, the National Radiological Board and the National Institute of Health seem to be very cautious in pronouncing the existence of a link. Why is this?*

- a. Electricity is essential to a modern society. Top level government bodies such as the IARC are concerned that issuing pronouncements will improve the welfare of the relatively small number exposed to high intensity fields, while endangering the prosperity of the majority of those who are not threatened by these fields. We should also not overlook the role of the utilities. As members of a regulated industry, the electric utilities have developed and deployed advanced lobbying tools. They have become very effective lobbyists who are able to influence policymakers on such matters.

21. *Do FHA regulations allow the issuance of insured mortgages for homes when*

transmission power lines are so close to homes that, even in theory, the supporting polls could fall on the house?

- a. No. FHA regulations prohibit the issuance of insured mortgages for houses very close to transmission power lines.

22. *What is the current status of research?*

- a. Research funding is a problem. One logical source for such funding would be the utilities' own research arm, the EPRI (formerly, the Electric Power Research Institute). However, there is evidence the EPRI declines to fund follow-up research when the original research uncovers evidence of magnetic field's potential to cause disease. It fails to fund the follow-up research even when its own analysts suggest the additional research should be conducted.
- b. The federal government completed in mid-1999 its \$45 million EMFRapid study that recommended passive actions in general, but did recommend transmission power lines be sited so as to reduce magnetic field emissions. However, the EMFRapid study based many of its findings upon research that is now recognized to be invalid. Had it been based upon valid research, it is likely its recommendations would have been much stronger. Nevertheless, there has been little federal research since that date.
- c. The California EMF project is just winding up. It has now released its findings. In its evaluation, it concludes magnetic fields **likely cause** childhood and adult leukemia, adult brain cancer, spontaneous abortions, and ALS. The evaluation further concludes that magnetic fields **possibly cause** childhood brain cancer, female and male breast cancer, Alzheimers disease, suicide, and heart problems.

© 2002 Power Line Task Force, Inc., All rights reserved

Table of contents

Doris Mast
160 Bayocean Road
Tillamook OR. 97141
May 11, 2011

Tillamook People's Utility District
1115 Pacific Avenue
Tillamook OR 97141

Dear Sir:

The magnetic fields from electrical currents even on the household level have influenced decisions I make. For instance our personal computer is an Acer desktop so small it sits behind our large screen TV which has HDMI hookups. With the use of the remote keyboard, we are 8 feet away from the TV which functions as the monitor. Naturally; the first thing I did after receiving the November letter about the proposed 115kV transmission line was to go to my computer and research. The articles I read increased my concerns. I do not believe it is wise or sensible to site this line on a route through Tillamook. The proposed route means I cannot go to the only hospital in Tillamook County without passing under the line. I cannot go to the grocery store without driving close to the lines. The proposed route is closer to my house than the 400 to 500 foot corridor generally recommended for residential areas and substation power lines. THIS MEANS 24-7 EXPOSURE FOR ME.

My biggest concerns were initially about health. We don't even have sodas in our house and my husband assured me that we would move before exposing ourselves to such a risk. At that point, the economic impact became real. The realtor fees, the moving fees, the work of finding a new place, the stress of adjusting to a new place, the loss of property value or being unable to get any offers because perceived risks of living so close to a transmission line, all became real. I have already talked with a lawyer because I am determined to do my part, working with my neighbors, to convince PUD that the path of least resistance for the proposed transmission line is not the current proposal.

Yours truly,



Doris Mast

David Mast
160 Bayocean Road
Tillamook OR. 97141
May 11, 2011

Tillamook People's Utility District
1115 Pacific Avenue
Tillamook OR 97141

Dear Sir:

I am opposed to the proposed route for the 115kV transmission line from Tillamook to Oceanside.

The route follows a major highway linking Tillamook and Portland. The huge transmission line will be the first thing that visitors from Portland will see as they drive into Tillamook. It will also be the major thing they see as they follow the 3 Capes Scenic Route on Bayocean Road.

The transmission line goes within 150 feet of the Tillamook post office, the county court house, the hospital as well as businesses, motel, restaurants and residences. The lines will be within 400 feet of the busiest areas of downtown Tillamook. I have copied some health information that needs to be considered because these lines will be so close to many people on a daily basis.

FAQ for Health Effects of Transmission Power Line Magnetic and Electric Fields

This FAQ is designed to answer in a brief and readily accessible format questions frequently asked about the dangers associated with exposure to magnetic and electric fields emitted by transmission power lines.

1. What are transmission power lines?

- a. They are those high voltage lines that carry power from power plants to substations or between substations. Generally, they carry voltage greater than 35 to 65 kV (kilovolts). Lines that carry power from substations to the ultimate users are called distribution lines. They generally use voltages under 35 kV. Transmission power lines radiate magnetic and electric fields that pulse sixty times per second. This is called extra-low frequency EMF (ELF-EMF).

2. How can I determine if a line is a transmission or distribution line?

- a. One rule of thumb is to count the number of mushroom shaped insulators between the line and the structure that holds the line. If there are more than three such insulators, it is likely to be a transmission line. If there are around 7-12 insulators, the line probably carries 115 kV. Twelve or more suggests the line carries more than 300 kV.

3. I feel nothing unusual when I am near a transmission power line. Why might they be dangerous?

- a. Transmission power lines emit two types of fields, electric and magnetic. Together they are called electro-magnetic fields, EMF. Magnetic fields are known to interact with animal tissues, and are therefore potentially dangerous. While a tiny minority can sense magnetic fields, most of us can detect neither magnetic nor electric fields.

4. *Are magnetic fields from power lines dangerous to human health?*

- a. There is substantial evidence that exposure to extra-low frequency magnetic fields of an average intensity greater than 2 milligauss doubles the risk of a child contracting leukemia. There is very good evidence that even momentary exposure to ELF fields greater than 16 mG increase by a factor of 5 a woman will have a spontaneous abortion within the first 10 weeks of pregnancy. There is also evidence that these fields are associated with other diseases (see below). Exposures below 2 mG appear to have no adverse health effects. High frequency magnetic fields emitted by cell phones and TV station antennas are a different phenomena.

5. *How common is magnetic field exposures at the dangerous levels.*

- a. Not very common. Less than 2% of the population experiences ELF magnetic fields that average more than 2 milligauss. Average US exposure is around 0.5-0.75 mG. The number of those who experience momentary exposures greater than 16 mG is not known.

6. *Are electric fields from power lines dangerous to human health?*

- a. There is little evidence that electric fields at the intensities associated with power lines directly impact human health. However, these fields have the potential for indirectly inducing harmful reactions. It is undisputed that fields above 1 mV/m (millivolt per meter) can disrupt heart pacemakers and defibrillators. Electric fields of this intensity, while rare in general, are common immediately adjacent to transmission power lines. Also, one researcher claims that electric fields from power lines ionize particles in the air, and these particles are carcinogenic. This research has been validated by epidemiological evidence.

7. *I live near a transmission power line. How do I know if I am in danger?*

- a. When assessing danger, distance is all-important. The current research seems to suggest that living further than 400 feet from a transmission line will provide an adequate margin of safety from magnetic fields. However, the very latest research suggests that pregnant women should *never* venture anywhere near a transmission power line, for even momentary exposure to high magnetic fields sharply enhances the risk of a miscarriage. They should avoid even driving under a transmission power line.
- b. Those utilizing pace makers or automatic defibrillators should similarly avoid even momentarily venturing near transmission power lines.
- c. Those concerned about the less-documented risks associated with particles ionized by electric fields should avoid outdoor exposures with 2000 feet downwind from transmission power lines.

8. *Are lower voltage power lines (say 115 kV) safer than high voltage (345kV and above) lines?*

- a. The risks associated with electric fields directly correspond to a line's voltage. Therefore, the risks associated with electric fields increase in tandem with the line's voltage.
- b. The better documented risks associated with a line's magnetic field are associated with the current going through a line rather than its voltage. To deliver a given amount of power, utilities must push more current thorough low voltage lines than high voltage lines. Therefore, in-field measurements show the magnetic field under a 115 kV line is often greater than the field immediately under a 345 kV line. Also, high voltage lines are customarily built on wider rights of way than low voltage lines. Therefore, people tend to live closer to low voltage lines than they do to high voltage lines. For these reasons, low voltage transmission

power lines generally pose a greater risk to human health than do high voltage lines. Lines with 65 kV or less usually emit very low levels of magnetic fields.

9. *Can magnetic fields be reduced by physical barriers?*

- a. Not usually. Walls, houses, trees and the like are no impediment to magnetic fields. Field measurements indicate occupants of the front seats of cars experience an approximate 30% reduction in magnetic fields.

10. *Can electric fields be reduced by physical barriers?*

- a. Yes they can. Furthermore, particles ionized by electric fields pose a danger only to those, like children, who are outside a good part of the day.

11. *How strong is the evidence identifying an associated between ELF magnetic fields and human disease?*

- a. There is extremely strong evidence finding a relationship between ELF magnetic fields greater than 2 mG and childhood leukemia. This relationship has been a matter of scientific inquiry since 1979. Sixteen out of nineteen studies conducted since 1995 are now viewed as identifying a statistically significant relationship between magnetic fields greater than 2 to 4 mG and a two to four-fold increase in a child's risk of contracting that disease.
- b. There is very strong evidence finding a relationship between maximum ELF magnetic field exposure greater than 16 mG and a 6-fold increase in miscarriages.
- c. There is strong evidence linking ELF magnetic fields and Alzheimer's and Lou Gehrig's disease (ALS).
- d. There is substantial evidence linking ELF magnetic fields greater than 12 mG and breast cancer and strong evidence linking magnetic fields and the suppression of the therapeutic effects of the anti-cancer drug, tamoxifen.

12. *How strong is the evidence linking electric fields and cancer?*

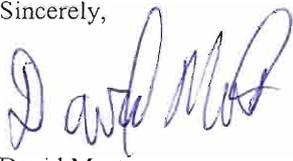
- a. There is only one source of studies linking ELF electric fields to the creation of cancer causing particles through ionization. However, a mechanistic process has been identified. It has been verified by in-field measurements, and validated through epidemiological studies.

© 2002 Power Line Task Force, Inc., All rights reserved

If you do not find a better solution, I will be one of the hundreds of people who will be living and working on a daily basis within the 400 feet of the transmission lines.

I am in solidarity with my neighbors and their concerns.

Sincerely,



David Mast